2 1935

THEORY

OF

SILK WEAVING

THEORY

OF

SILK WEAVING

A Treatise on the Construction and
Application of Weaves, and the
Decomposition and Calculation of
Broad and Narrow, Plain,
Novelty and Jacquard Silk Fabrics

Containing 95 Plates

By ARNOLD WOLFENSBERGER

Graduate of the Textile Institute of Zurich,
Switzerland

Second Revised and Enlarged Edition

NEW YORK
Issued by THE AMERICAN SILK JOURNAL
CLIFFORD & LAWTON
Publishers
1921

COPYRIGHT, 1921, by CLIFFORD & LAWTON
All rights reserved

GROLIER CRAFT PRESS, Printers. 229 West Twenty-eighth Street, New York City

PREFACE

THE silk industry of America has of late years rapidly advanced to the front rank among the great textile industries of the world. It may indeed be proud of this position, to which that enterprising spirit and untiring energy peculiar to our nation, combined with our great technical and natural resources, has brought it.

That we are, on the other hand, not yet at the height of perfection we are also compelled to acknowledge, but if we consider the short space of time that the American industry has required for its development, as compared to the decades, almost centuries, to which some of the great European silk centers can look back, the fact is neither surprising nor discouraging.

While it must not be our aim to imitate or copy their ways, inasmuch as our conditions and circumstances are quite different from theirs, we may still profitably study their methods in order to overcome our deficiencies.

The greatest advantage which our competitors derive from such a long existence consist in having at their disposal a force of skilful, trained help. The manufacturers, appreciating the importance of this factor, make great efforts and pecuniary sacrifices to elevate and maintain the high standard of their industry.

For instance, they support textile schools and lecture courses, where young men can acquire a thorough technical education and equip themselves for a career of usefulness, thereby serving their own interests and at the same time furthering those of their chosen profession.

This beneficial influence cannot fail to exert itself from the standard of the higher employer down to that of the weaver, who would naturally take more pains and interest in his work than if he were a mere mechanical appendage to his loom in order to keep it in motion.

Very little has been done in his country for technical education as far as the silk industry is concerned, and it was this circumstance, as well as the absence of technical literature on this special branch, that prompted the author to offer in the present little work a treatise on the theory of shaft weaving for broad silks and ribbons.

It is divided into three principal parts:

1st. Drawing-in the warp in the harness.

2nd. The weaves and their application.

3rd. Decomposition or analysis of the cloth.

To the foregoing there have been added in the revised and enlarged edition several additional parts covering the following: Jacquard Weaves, Box Loom Weaves, including Crepes, and Cost Calculations for plain and fancy weaves.

The subject while condensed, is made as clear and comprehensible as possible, and to many desirous of increasing their knowledge in this direction, this should prove a valuable help.

The author, through the medium of this work, hopes to win the approval and encouragement of the manufacturers, and will feel amply repaid should his efforts tend to develop a deeper interest in the "Queen of Textiles."

INDEX

Page

- Drawing-In 7
  - Straight Draws 7
  - Skip Draws 9
  - Point Draws 9
  - Section Draws 10
- The Weaves and Their Construction 15
  - The Taffeta Weave 17
  - Gros de Tours Weaves 19
  - Serge Weaves 20
  - Twill Weaves 20
- Filling Effects 21
  - Satin de Lyon 21
  - Levantine 21
  - Polonaise 22
  - Serge grosse coté 22
  - Serge Romaine 23
  - Serge 23
- Warp Effects 25
  - Levantine 25
- Evensided Twills 26
  - Surah 26
  - Croise 26
- Pointed Twills 27
- Satin Weaves 32
  - Satin de Chine 31
  - Satin Merveilleux 34
  - 7 Harness Satin 35
  - Duchesse 35
- Irregular Satins 39
  - Satin Turc 39
  - Satin à la Reine 40
- Derivative Weaves 41
  - From the Taffeta 41
  - From the Twills 43
  - From the Satin Weave 46
  - Cannele and Repp Weaves 49
- Double Faced Fabrics 55
  - Warp Effects 55
- Filling Effects 58
  - Pekins 60
  - Bayadères 63

INDEX—Continued

Page

Checks and Plaids ... 65

DECOMPOSITION ... 67

The Weave ... 68

Length and Width of the Fabric ... 68

The Stock and Its Dye ... 69

Reed Calculation ... 70

Drawing-in the Warp in Harness and Reed ... 70

Warping Ticket ... 71

Harness Arrangement ... 71

Reduction of the Filling ... 71

Calculation of Warp and Filling ... 71

Finishing ... 72

Calculation of Cost ... 72

DISPOSITIONS ... 75

JACQUARD WEAVES ... 100

Box Loom Weaves Including Crêpes ... 100

Manufacturing Costs ... 101

CALCULATIONS ... 103

Calculation Blank ... 110

OTHER BOOKS

Published by

CLIFFORD & LAWTON

373 Fourth Avenue **New York.**

THE AMERICAN SILK JOURNAL

Established 1882. A monthly magazine devoted exclusively to dress silks, ribbons, and all silken materials, reflecting the progress of mill and market, fashions, trade events and news. Published on the first of each month.

Subscription: United States, $3; Canada, $3.50; Foreign, $4 a year

SERIVALOR

or the True Value of Raw Silk

By ADOLF ROSENZWEIG,

The great international authority on silk.

A practical and logical system of standardizing raw silks. Price, $1.25 postpaid.

DICTIONARY OF SILK TERMS

The most complete and authentic dictionary ever published on silk terms, from the raw silk to the finished broad and narrow silks, including weaves, styles, patterns, effects, colors, trade-marks, etc. Bound in cloth, 93 pages, price, $1.50 postpaid

COLOR VALUE

By C. R. CLIFFORD.

A valuable book treating on color contrasts and harmonies. It will assist the manufacturer, styler, designer and retailer in the selection of colors. Colored plates and diagrams illustrating the fundamental principles of the subject, of inestimable value to either student or artisan. Price, $1.50 postpaid

PERIOD FURNISHINGS

By C. R. CLIFFORD.

An encyclopedia of furnishings, decorations, furniture. Contains 2,731 illustrations, 266 pages, size 9¾ x 12; 112 fabric illustrations, covering all periods. Price, $6.00 postpaid.

THEORY OF SILK WEAVING

DRAWING-IN

With this term we designate the operation preceding the weaving, by which all the warp-threads are drawn through the heddles of the harness.

The order in which this is done varies according to the weave and the nature of the fabric to be produced; so we distinguish:

Straight draws,
Skip draws,
Point draws,
Section draws.

STRAIGHT DRAWS

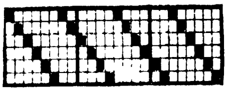

Fig. 1

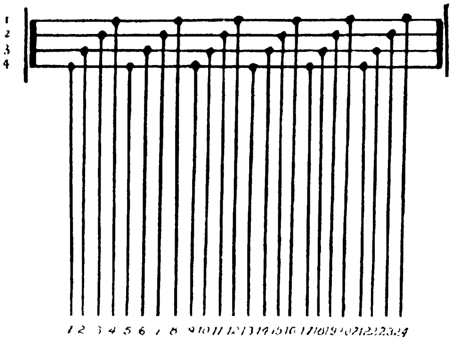

Fig. 2

These form the simplest and most common method of drawing-in. We begin with the first heddle on the left side of the shaft *nearest to the warp beam,* then take the first heddle of second shaft and so on until all the shafts the set contains are used in rotation. This completes one "draw," and this operation is repeated until all the warp threads are taken up

The method of making the shaft nearest to the warp-beam the first, is almost universal with the silk business and is technically called *drawing-in from back to front*

The opposite, or drawing in from *front to rear,* is used occasionally, however, and in this case makes the first heddle on the left hand side of the front shaft No. 1.

The making out of the *Drawing-in Draft,* which must indicate the arrangement or the rotation in which the warp-threads are drawn in, can be done in various ways, of which we will mention the two most popular methods. The first is by using common designing paper, and indicating the rotation by dots. The horizonal rows of squares represent the shafts, the vertical rows the warp-threads. Fig. 1 shows four repeats of a straight draw on six harness marked out according to this idea. A second method is to use paper ruled horizontally, the lines representing the shafts; and to draw vertical lines for the warp-threads. The latter are made to stop on the lines bearing the number of the shafts into which the respective threads are to be drawn. Fig. 2 is such a draft, illustrating six repeats of a draw on four harness from "Front to Rear."

SKIP DRAWS

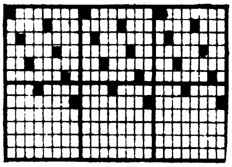

Fig 3

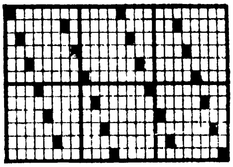

Fig 4

The draws coming under this heading are used very extensively in silk weaving, especially for fabrics requiring a heavy warp and a large number of shafts. Enter first the odd and then the even shafts. An 8 harness draw of this kind, of which three repeats are shown in Fig. 3, runs as follows: 1, 3, 5, 7, 2, 4, 6, 8.

Fig 4 is a 12 harness draw of the same class.

POINT DRAWS

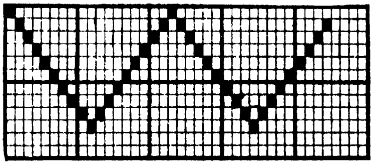

Fig. 5

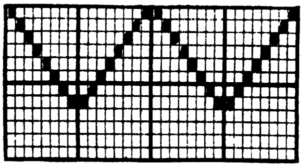

Fig. 6

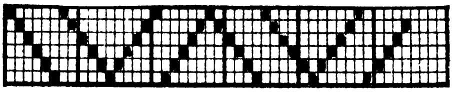

Fig. 7

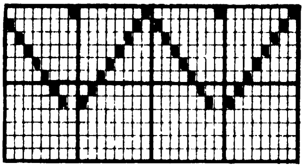

Fig 8

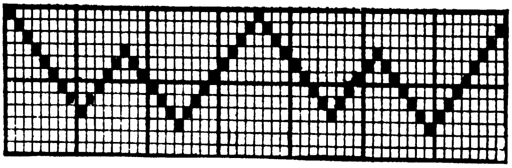

Fig. 9

Point draws are a combination of a regular straight draw from back to front and one from front to back, the first and the last shafts only being used once, while the rest receive two ends each in one repeat of the draw. Fig. 5 illustrates a regular point draw in 2 repeats on 10 shafts. It will be seen that 14 ends make a repeat; in fact, the number of warp-threads required for one draw will always be double the number of harness less 2, hence a 12 harness regular point draw will require 22 warp-threads for a repeat.

The drawing-in draft illustrated in Fig. 6 is a slight variation of the regular point draw; it consists, as will be seen, of a draw from back to front, and also a full one from front to back, thereby causing a *double point*

Another change from the regular point draw is illustrated in Figs. 7 and 8; this class may be called *Broken point draws*, because a new draw is begun before the other one is complete Fig. 9 also comes in this class and represents a *zigzag draw* on 10 harness.

The drawing-in drafts which we have described under the head of "Point draws," are used mostly to obtain the various pointed and zigzag effects.

SECTION DRAWS

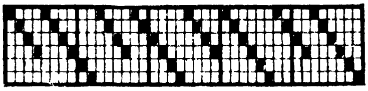

Fig 10

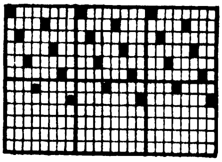

Fig. 11

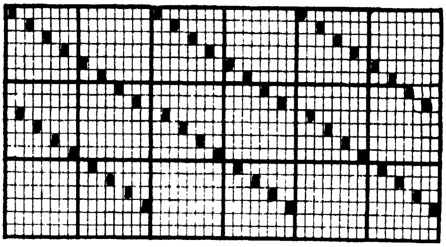

Fig. 12

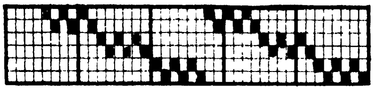

Fig. 13

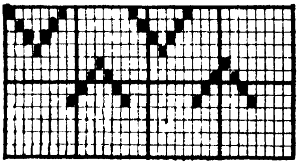

Fig. 14

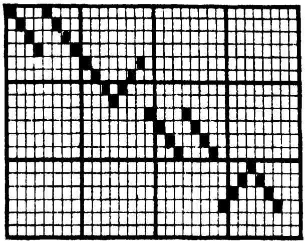

Fig. 15

This division of drawing-in drafts is used extensively in silk manufacturing; for instance, in all fabrics having a ground warp and a binder warp, also in double-face goods, or where two different weaves are combined in one effect.

One or more threads are drawn on the first section, then one or more on a second and third, if the harness is divided in so many sets.

The following examples will illustrate the principle of these draws:

In Fig. 10, shafts 1, 2, 3, 4 from the first set, shafts 5 and 6 the second, 8 threads are drawn straight on the first, then 2 on the second section.

Fig. 11, first set shafts 1 to 6 inclusive, second set shafts 7 and 8.

Fig. 12 is drawn end and end on two sections having 8 shafts each.

Figs. 13, 14 and 15, while not strictly belonging to the class of section draws, may, however, be considered under this heading. The idea is to draw a certain number of ends in one part of the harness and another group in another part, be it straight, point or skip, which will cause the effect on the cloth to be accordingly transposed or broken up.

THE WEAVES AND THEIR CONSTRUCTION

In any woven fabric we distinguish two systems of threads, the *Warp or Chain*, running lengthways in the cloth, and the *Filling or Weft*, crossing the former at right angles.

This crossing or interlacing consists of every individual warp-thread being placed alternately under and over one or more threads of the filling system. The arrangement of this interlacing is technically called the *Weave*, and the variety in which the points of crossing can be distributed is practically endless.

It is principally the weave that lends to a fabric its character, influenced, of course, by the material used, the size and tension of the threads and the combination of the colors.

The weaves are divided into three main classes: *the Foundation weaves*. In the silk business they are known under the following names:

The Taffeta Weave,
The Serge Weave,
The Satin Weave.

In the foundation weaves each thread effects only one crossing in one repeat of the weave, and the points of interlacing occur in a given rotation. A repeat in the foundation weaves comprises the same number of warp-threads as of *picks* or filling threads, and if this number is 8, for instance, the weave is called an 8-shaft or an 8-harness weave. In marking out a weave, the warp threads are represented by vertical lines, the filling by horizontal ones, or in each case by the space between these lines. The places where a warp-thread lies over the filling are marked with paint or simply with a cross. In a similar manner we mark out the *chain draft*, which indicates the rotation in which the shafts are raised.

THE TAFFETA WEAVE

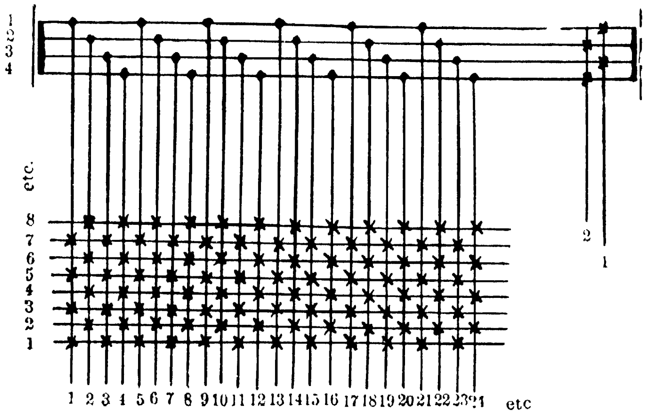
1
2
3
4
etc.
8
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 etc
2
1

Fig. 16

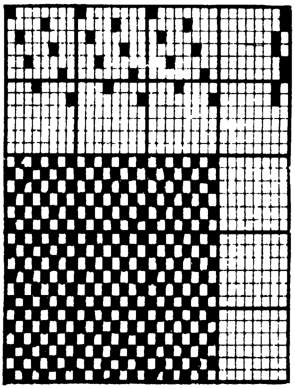

Fig. 17

This is the simplest and oldest method of interlacing. The odd numbers of warp-threads cross the even numbers after every pick; hence of two warp-threads one will always go over the first pick and under the second, and the other end under the first and over the second pick. Taffeta cloth therefore, has the same appearance on both sides, and in cotton and wool weaving this weave is technically and properly indeed called the *Plain Weave* It has the smallest repeat, 2 warp-threads and 2 picks, and the exchanging of warp and filling is the most frequent possible. The cloth thus produced is firmer and stronger than that obtained with any other weave.

Fig. 16 is a taffeta on 4 shafts straight draw, the draft executed in the manner which we have already mentioned in explaining the drawing-in drafts.

Fig. 17 on common designing paper, illustrates a taffeta made on 8 harness, skip draw.

Be it mentioned that the drawing-in draft and the chain draft will be added throughout this work, the former over the weave to correspond with the respective warp-threads, the latter to the right of the drawing-in draft.

GROS DE TOURS WEAVES

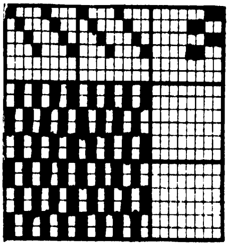

Fig. 18

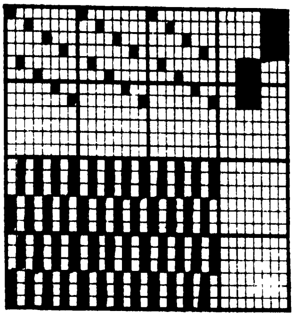

Fig. 19

In this weave the working of the warp is the same as in taffeta, except that instead of one pick, two or more are inserted in the same shed. It is mostly used in selvedges, where it serves to give more firmness to the edge of an otherwise loosely woven cloth, and prevents the weaving ahead of the edge in a tight weave. Gros de Tours is sometimes used, especially when cotton or wool filling is employed, with a view to lay two picks nicely side by side, whereas a thread entered two ply with the taffeta weave will always receive some twist, which may disturb the perfect evenness of the fabric.

Fig. 18 is a Gros de Tours with two picks on four harness straight through.

Fig. 19 illustrates this weave with three picks drawn end and end on two sections of four shafts each.

SERGE or TWILL WEAVES

While the taffeta weave produces either an entirely smooth fabric, or one with a distinct transverse rib as in gros grain, the twill weave forms diagonal lines on the cloth, running either from left to right or from right to left.

To make a twill, not less than three ends and three picks are required, of which each thread floats over two of the other system and interlaces with the third. The rotation of the interlacing is always consecutive that is, it moves with each succeeding pick one thread to the right (or to the left if the lines are to run in that direction). If warp and filling have the same texture, that is the same number of threads in a given space, the twill lines will form an angle of 45° ; if the warp stands closer than the filling, the incline will be steeper, and in the opposite case the angle will approach more the horizontal.

The weaves can be expressed in numbers, for instance the 3-end twill warp effect would be marked 2-1, which indicates that each warp-thread goes over two and under one pick

Twill weaves are called *evensided* when the arrangement of "warp up" and "filling up" are evenly balanced, and *unevensided* if either warp or filling predominate on the face of the fabric; the latter class is therefore subdivided in *Warp effects and Filling effects*

In the following a number of serge weaves are illustrated, the French designations being added in some cases, as they are still extensively used in the trade.

FILLING EFFECTS

Satin de Lyon, 2-1.

On 6 harness straight through.

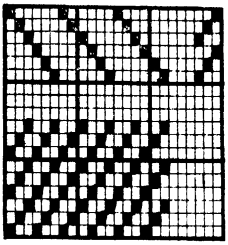

Fig. 20

Levantine, 3-1

On 8 shafts skip draw.

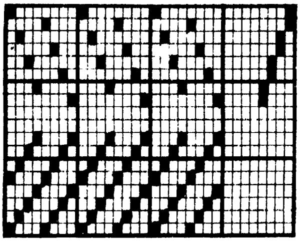

Fig. 21

Polonaise, 5-1.

On 12 harness skip draw.

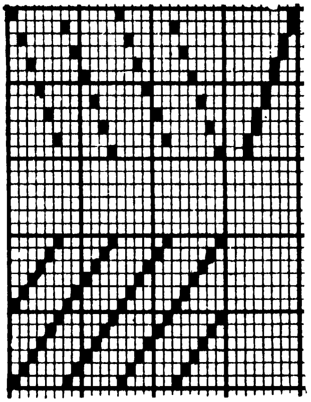

Fig 22

Serge grosse côte, 7-1.

On 8 shafts straight through.

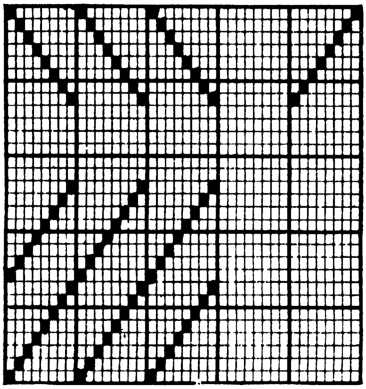

Fig. 23

Serge romaine, 6-2.

On 8 shafts skip draw.

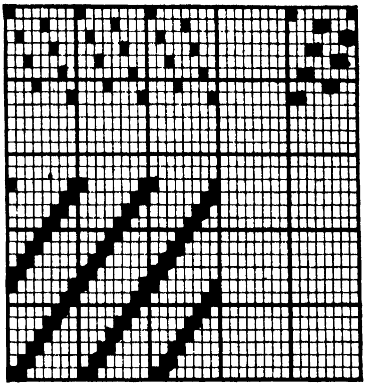

Fig. 24

Serge, 5-1, 1 1.

On 8 shafts skip draw.

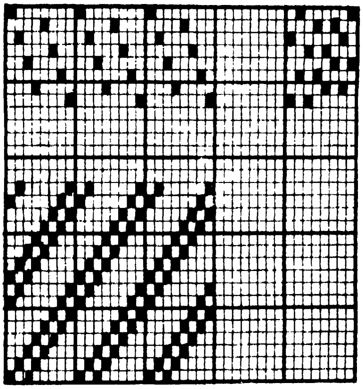

Fig. 25

Serge, 4-2, 1-1, 1-1.

On 10 harness straight through.

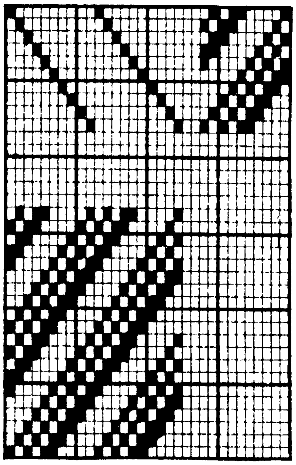

Fig. 26

Serge, 7-1, 1-1, 1-1, 1-1, 1-1

On 16 shafts skip draw.

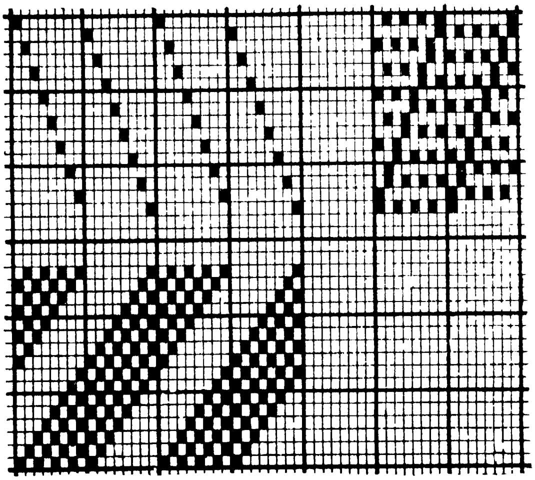

Fig. 27

WARP EFFECTS

Levantine, 3-1

On 4 shafts straight through.

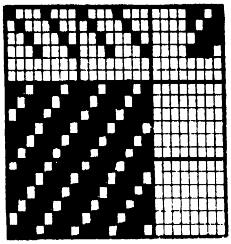

Fig. 28

Serge, 5-1, 1-1

On 8 shafts skip draw.

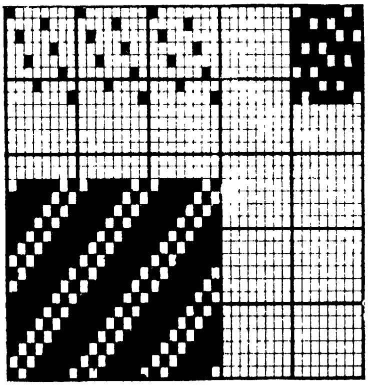

Fig. 29

EVENSIDED TWILLS

Surah, 2-2.

On 4 shafts straight through.

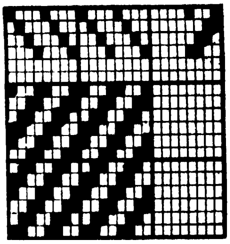

Fig. 30

Croisé, 3-3, 2-2, 1-1.

On 12 shafts straight through.

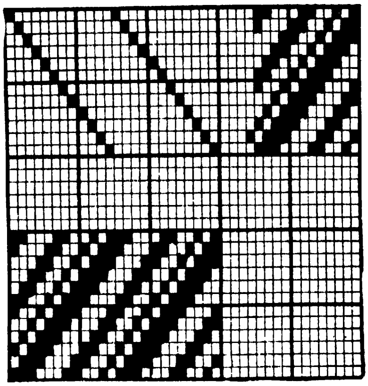

Fig. 31

Serge, 7-7, 1-1, 1-1, 1-1.

On 20 shafts skip draw.

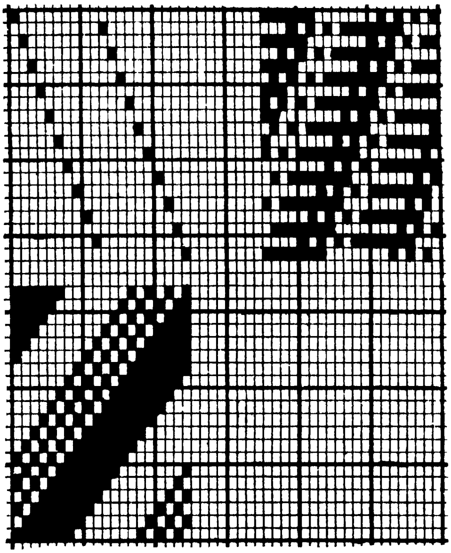

Fig. 32

POINTED TWILLS

in the direction of the filling and also of the warp

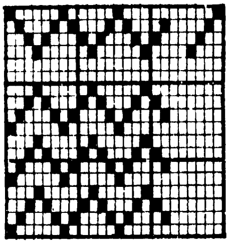

Fig. 33

On 4 shafts point draw, weave 3-1.

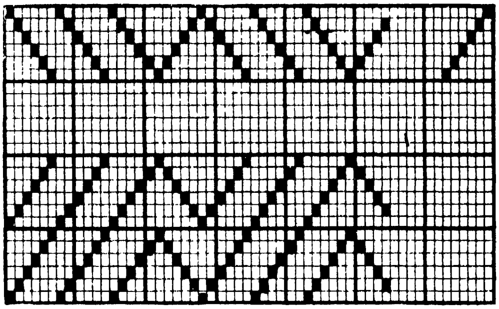

Fig. 34

On 6 shafts point draw, drawn as follows:

Eighteen ends from back to front and 4 ends from front to rear, weave 5 1.

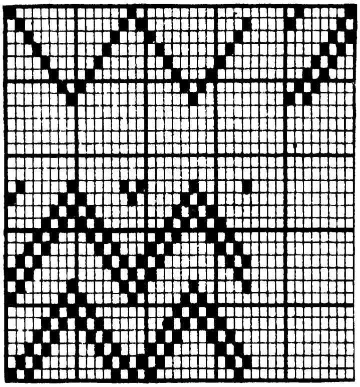

Fig. 35

On 8 shafts pointed draw, weave 5-1, 1-1.

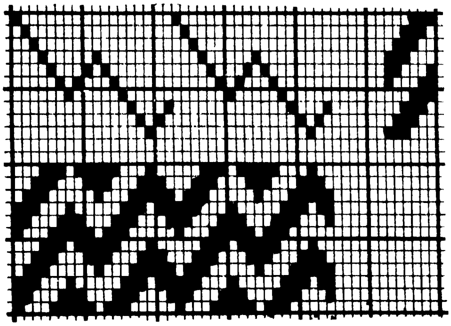

Fig. 36

On 10 shafts, with weave 3-3, drawn as follows

7 threads from back to front.
3 " " front to rear.
6 " " back to front.
2 " " front to rear.

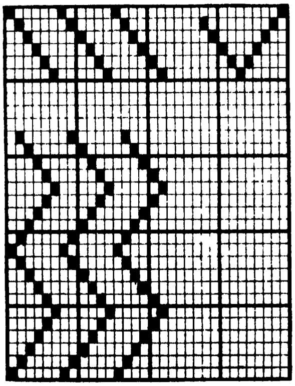

Fig. 37

On 6 shafts straight draw, pointed weave 5-1.

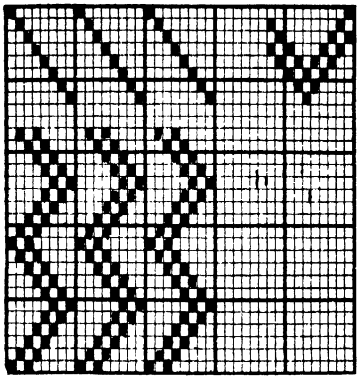

Fig. 38

On 8 shafts straight through, pointed weave 5-1, 1 1

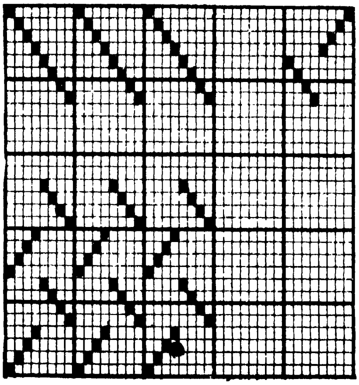

Fig. 39

Broken pointed twill, on 8 harness.

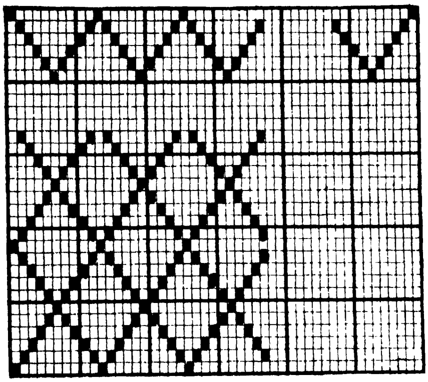

Fig. 40

On 6 shafts point draw, pointed weave 5-1.

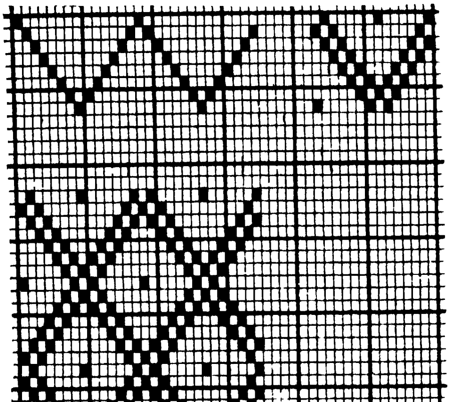

Fig. 41

On 8 shafts point draw, pointed weave 5-1, 1-1.

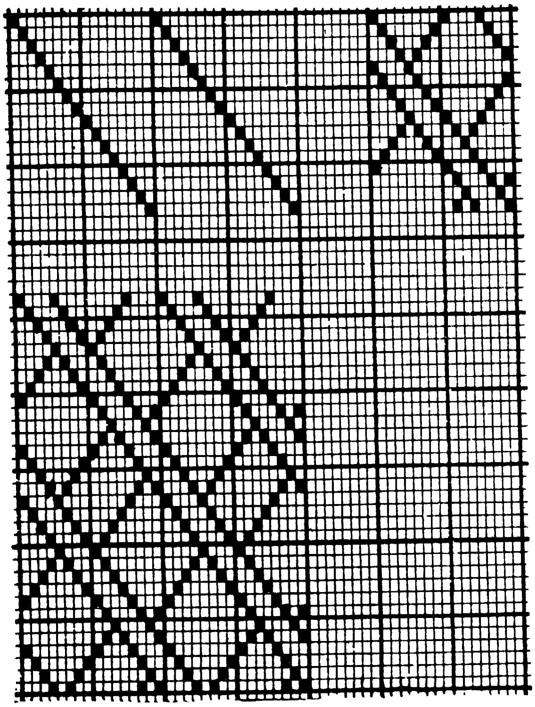

Fig. 42

Fancy twill, on 16 shafts straight draw.

SATIN WEAVES

The distinct diagonal lines which characterize the class of weaves explained in the previous chapter are absent in the satin weaves; and while the interlacing in the former is done in a strictly consecutive order, we endeavor to scatter the points of stitching in the latter as much as possible, in order to create an entirely smooth and brilliant surface on the cloth.

In all satins the number of ends in a repeat is the same in warp and filling.

The lowest repeat of a regular satin comprises five threads of each system, and the interlacing is done in the following order:

The	1st	pick	with the	1st	warp-thread
"	2d	"	"	3d	"
"	3d	"	"	5th	"
"	4th	"	"	2d	"
"	5th	"	"	4th	"

Fig. 43 illustrates this weave. An examination of the rotation, as given above, will show that every warp thread intersects two picks apart from its neighbor. The number "2" is in this case what is technically known as the *counter*, that is the number which indicates the points of interlacing by adding it to number 1 and continuing so until all the warp threads are taken up.

The following is the rule to find the counter for any regular satin:

Divide the number of harness into two parts, which must neither be equal nor have a common divisor. Any of these two numbers can be used for counting off, but usually the smaller one is taken. According to this rule we obtain a regular satin

On	5	harness	with counter	2
"	7	"	"	2 or 3
"	8	"	"	3
"	9	"	"	2 or 4
"	10	"	"	3
"	11	"	"	2, 3, 4 or 5
"	12	"	"	5
"	13	"	"	2, 3, 4, 5 or 6
"	14	"	"	3 or 5
"	15	"	"	2, 4 or 7
"	16	"	"	3, 5 or 7.

The 4 harness broken twill, Fig. 53, is sometimes classed among the satins.

The 6 harness satin, Fig. 54, is irregular; as a counter cannot be derived from number 6 by the given rule. The rotation generally used is 1, 3, 6, 4, 2, 5.

Regular Satins

5 harness Satin, "Satin de Chine."

Straight draw, counter 2.

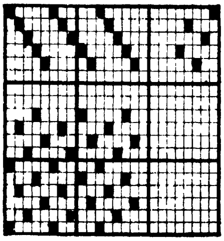

Fig. 43

7 harness Satin, "Satin Merveilleux"

Skip draw, counter 2.

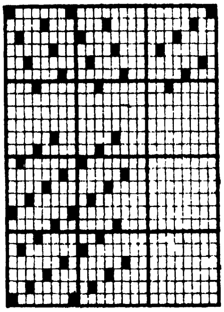

Fig. 44

7 harness satin

Straight draw, counter 3.

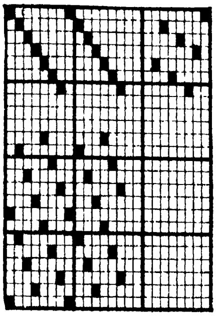

Fig. 45

8 harness satin, "Duchesse."

Skip draw, counter 3.

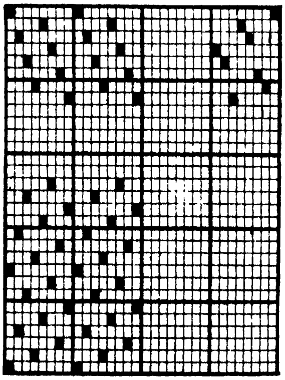

Fig. 46

9 *harness satin*

Straight draw, counter 4.

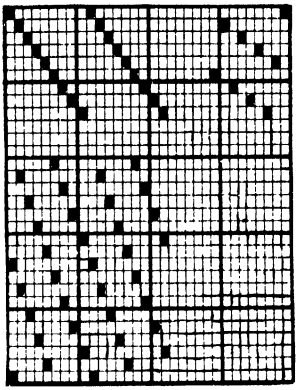

Fig. 47

10 *harness satin*

Straight draw, counter 3.

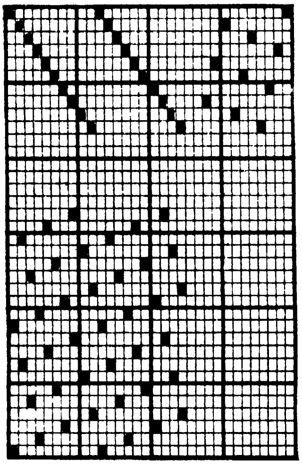

Fig. 48

11 *harness satin*
Skip draw, counter 5.

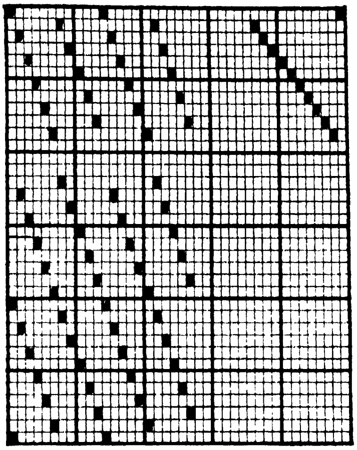

Fig. 49

12 *harness satin*
Skip draw, counter 5.

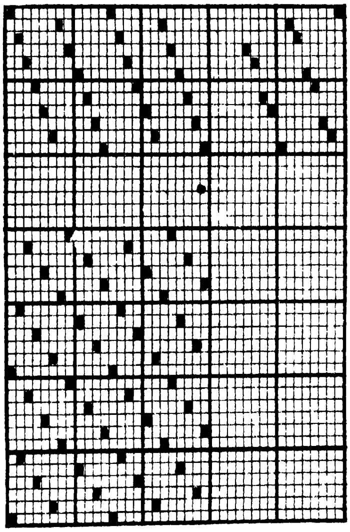

Fig. 50

16 *harness satin*

On 2 sections of 8 shafts each, drawn end and end, counter 7

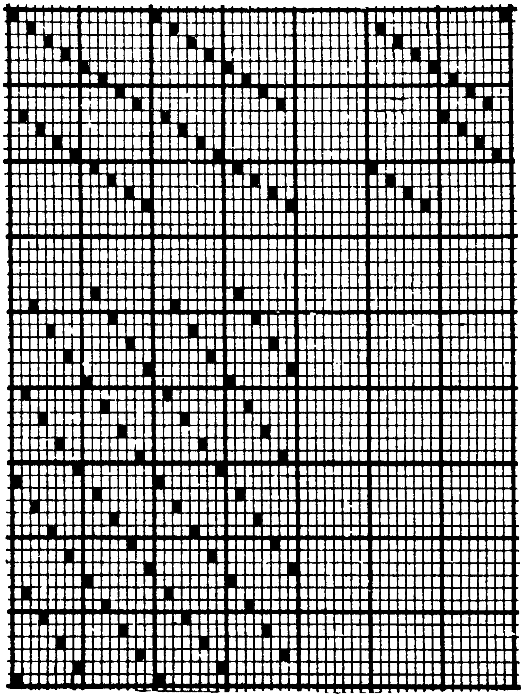

Fig. 51

8 harness satin, warp effect

Straight draw, counter 3.

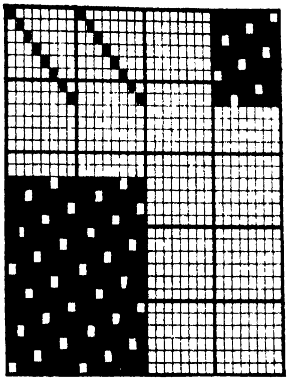

Fig. 52

IRREGULAR SATINS

Satin Turc.

On 4 shafts straight through.

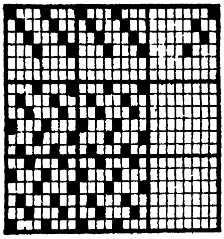

Fig. 53

Satin à la Reine

On 6 shafts straight draw.

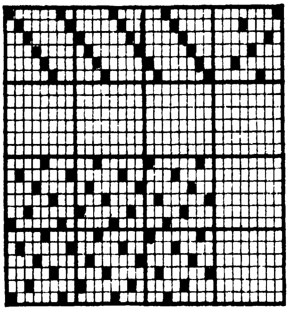

Fig. 54

DERIVATIVE WEAVES

1. From the Taffeta

Royale is a modification of the regular Gros de Tours, inasmuch as the rib line, which in the latter runs straight across the cloth, is broken off after a given number of warp threads. These groups, which may comprise 8, 12 or more threads, will interlace each one pick higher than the preceding one.

Royale of 8 ends

On 2 sections of 4 shafts each.

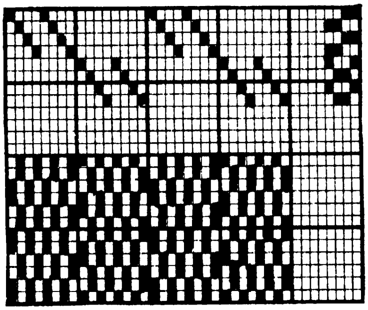

Fig 55

Velours Ottoman or Faille française

In order to obtain a broader rib than that of Gros de Tours, and at the same time to lend firmness to the fabric, we add to the ground warp, which forms the ribs, another or binder warp, which works continually taffeta, while the ground warp changes only every 3 or 4 picks for the rib.

Faille française

4 ends of ground on the first section of 8 shafts, skip draw.
1 " binder " second " 2 "

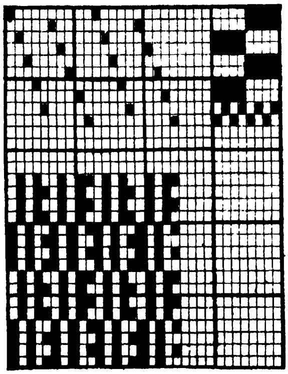

Fig 56

Velours Ottoman without a Binder-warp

In this weave, of which Fig. 57 illustrates a specimen, comprising 8 warp-threads and 32 picks in a repeat, the rib contains 4 picks. Of the 8 warp-threads, 3 float over and 3 under the rib, while the 2 others bind taffeta, which latter function is executed by 2 other threads in the next rib.

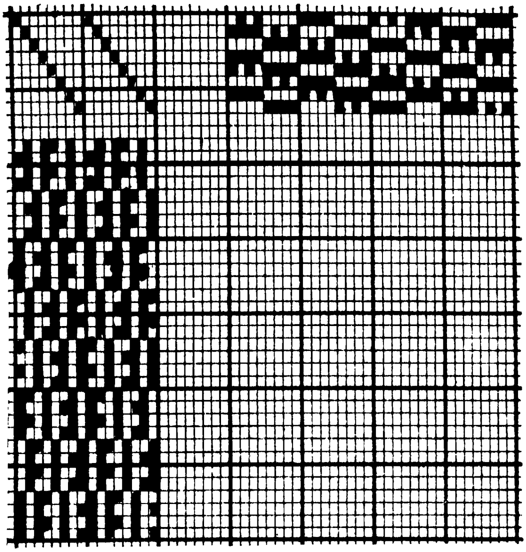

Fig 57

2. From the Twills

One variety is obtained by interlacing the warp-threads alternately one or more picks behind, and then a number of picks ahead of their respective neighbors; so the complete arrangement of the points of binding in a repeat will generally form two parallel diagonal lines. This will cause the twill lines to appear less pronounced than is the case in the regular twill, and the character of the fabric approaches more that of the satin.

Satin Sergé
On 8 shafts, straight draw.

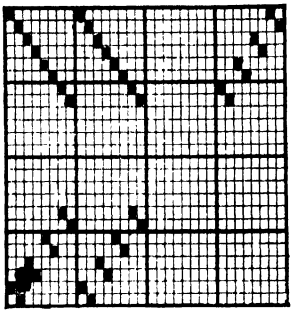

Fig. 58

Côte Satinée.
On 16 harness, skip draw.

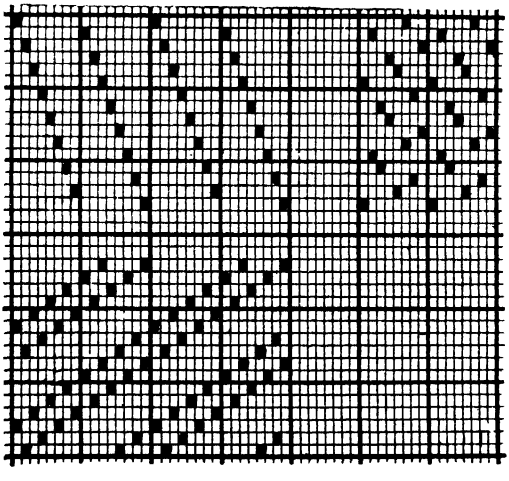

Fig. 59

Rhadzimir-Surah 2-2. After a certain number of picks of the regular surah all the warp-threads are crossed in two's, thereby causing a sort of a rib or cut line across the fabric.

Rhadzimir of 4 picks
On 8 shafts, straight draw.

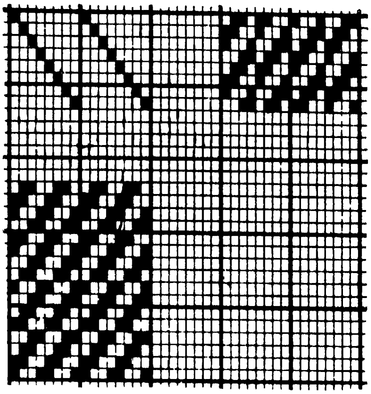

Fig. 60

Rhadzimir of 6 picks
On 8 shafts, straight draw.

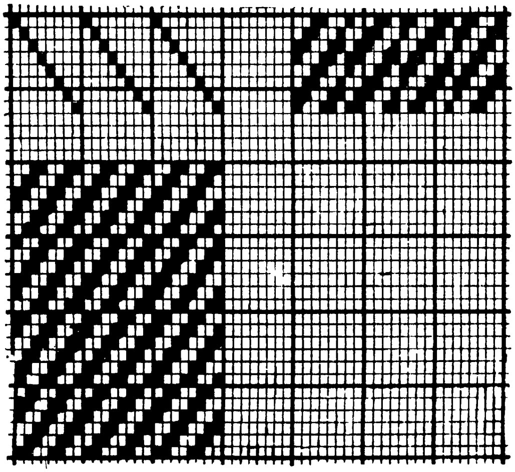

Fig 61

3. From the Satin Weave

Satin Soleil shows a satin-like surface with a cross line appearance. Fig. 62 illustrates it as made on 8 shafts, straight draw.

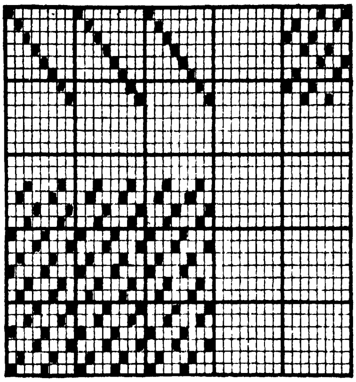

Fig. 62

Satin Grec is a 12-harness satin, in which a taffeta point is added to each place of interlacing, thus giving the cloth a much firmer hand. Fig. 63 represents this weave on 12 shafts, skip draw.

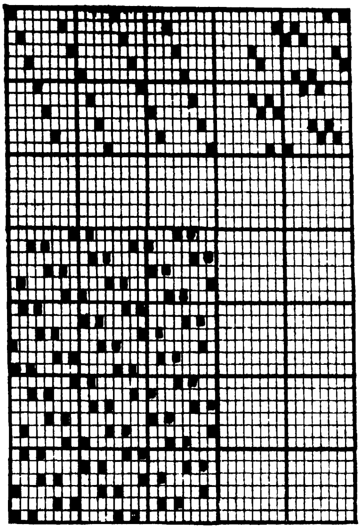

Fig. 63

Peau de Soie An 8 shaft satin with one point added on the right or left to the original satin spots, giving the fabric a somewhat grainy appearance Fig. 64 represents a peau de soie on 8 shafts, straight through.

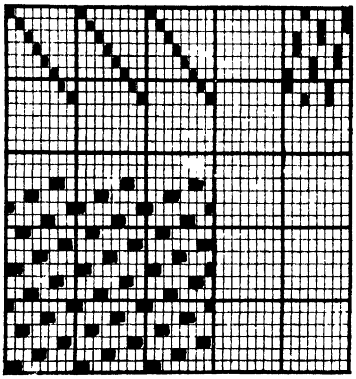

Fig 64

Fleur de Soie. The face is a satin de Lyon (2-1 twill), with a backing interlaced on the 12-shaft satin principle, Fig. 65, on 12 shafts, skip draw.

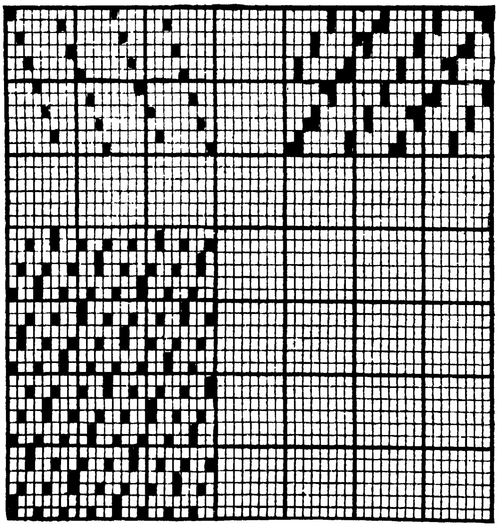

Fig. 65

CANNELE and REPP WEAVES

are in their construction related to the taffeta, and are used mostly in the form of stripes as an additional ornament to a fabric. The threads going into the composition of these effects exchange continually from taffeta interlacing to floating over a certain number of threads, and must be introduced either in warp or filling close enough to make the floats cover up the taffeta work entirely, and thus enable the material used to show up with the full brilliancy it possesses.

Cannele effects can be produced in two distinct ways. One is to let every individual thread work alternately taffeta and float, while in the other method one thread weaves always taffeta and a second thread is used for the cannele exclusively. These latter threads must come from a separate warp, which is introduced to embellish the ground or taffeta part of the fabric.

The floating threads can either stitch all on one pick and so form a continuous cut line, or be divided in groups, of which one will bind in the middle of the floats of the other group. The following designs show both the face and backside of the respective weaves

Alternating Cannele of 6 picks.
On 4 shafts, straight through.

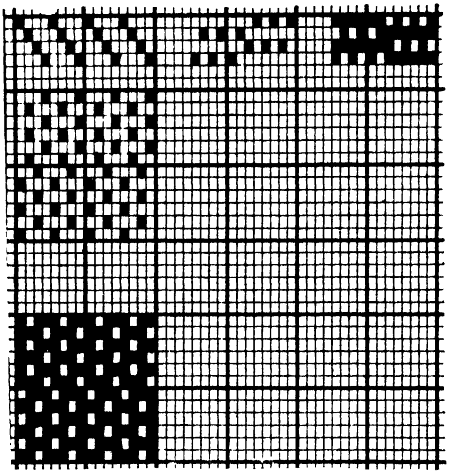

Fig 66

Cannele (2 beams). Over 3 picks, interlacing on every fourth pick, drawn end and end on 2 sections of 4 shafts each.

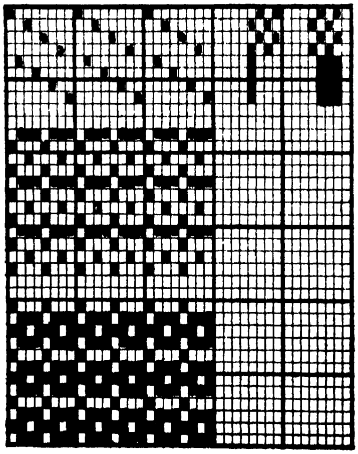

Fig. 67

Cannele over 5 picks, binding on the sixth, but every second thread advanced 3 picks (to the middle of the float of the first thread), drawn end and end on 2 sections of 4 shafts each.

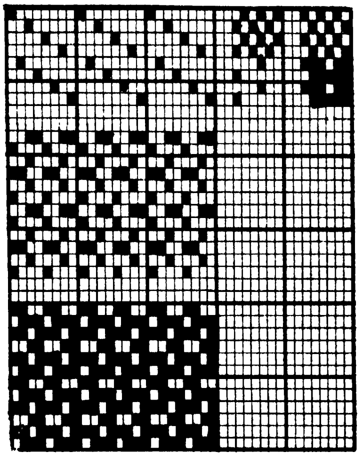

Fig. 68

Cannele arranged in groups of 8 threads, floating over 6 picks and binding on the seventh and eighth, drawn on 2 sections, with 4 shafts in first and 2 in second section.

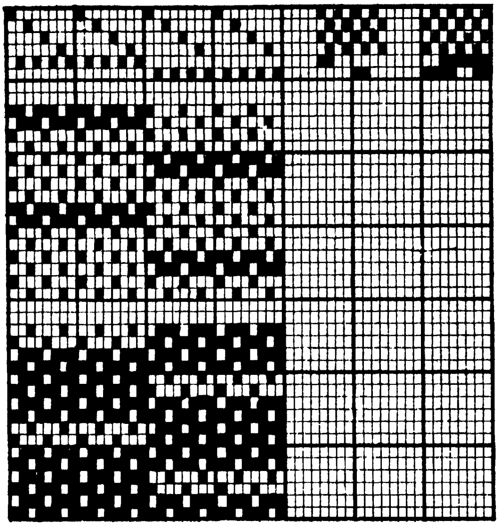

Fig. 69

Repp on 8 shafts straight through. Rotation of filling 1 pick taffeta, 1 pick float (rib).

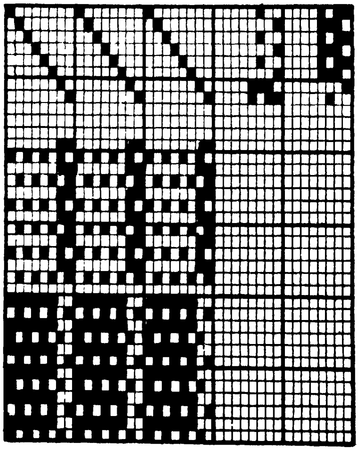

Fig. 70

Repp of 8 threads, on 2 sections of 4 shafts each, 8 ends per section.

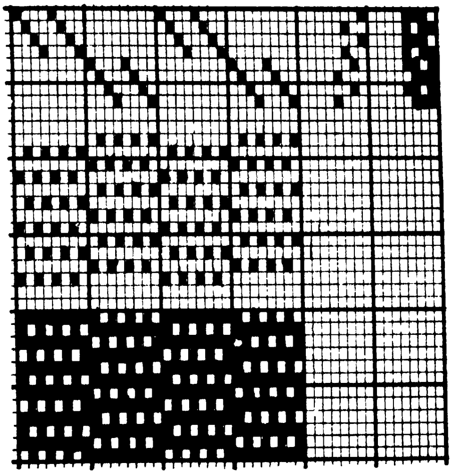

Fig. 71

Repp of 5 threads, binding on the sixth; every second pick binds on the middle of the first pick. Or 6 harness straight draw.

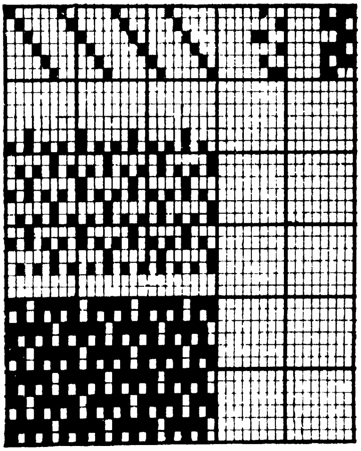

Fig. 72

Repp in groups, floating over 6 ends and binding on the seventh and eighth on 8 shafts straight draw.

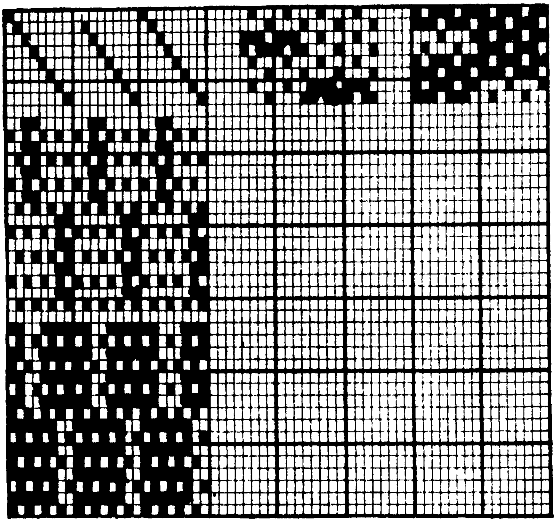

Fig. 73

DOUBLE FACED FABRICS

In this class we find either two systems of warp or of filling so combined that only one will be visible on either side. The color on one side is generally different from the other, and so may the interlacing be of a different nature on face and back. In the latter case great care must be exercised not to allow the weave on one side to disturb the one on the other, and as a rule the points of interlacing of the first warp or filling system are placed as much as possible in the middle of the floats of the second. This will prevent either color or weave to be seen on the opposite side, as the floats of one side will naturally lay themselves over the binders of the other. The number of ends in a repeat of the two weaves must either be alike or one a multiple of the other.

Warp Effects

Levantine on 8 shafts straight draw.

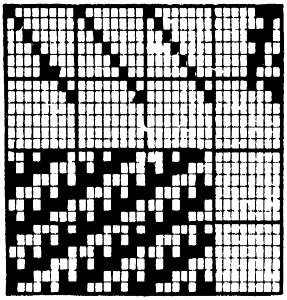

Fig 74

Serge 6-2 on 2 sections of 8 shafts each.

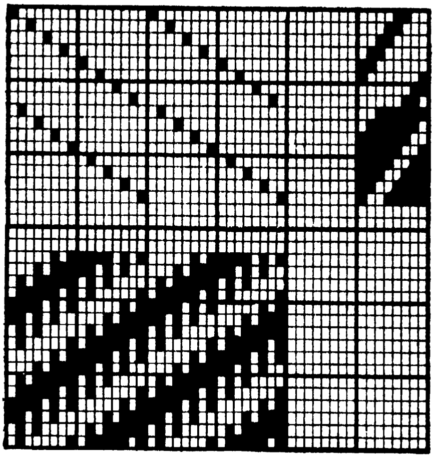

Fig. 75

8 *shaft satin* on 2 sections of 8 harness each.

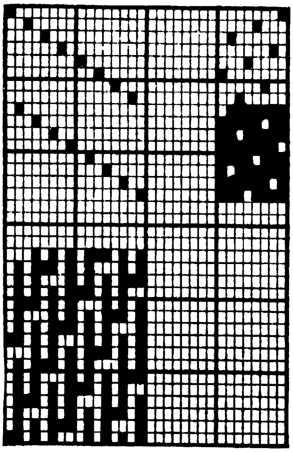

Fig. 76

12 *shaft satin* on 2 sections of 12 shafts each.

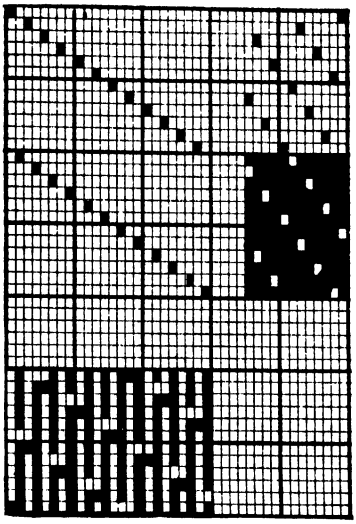

Fig. 77

Cannele of 8 picks on 2 sections of 4 shafts each.

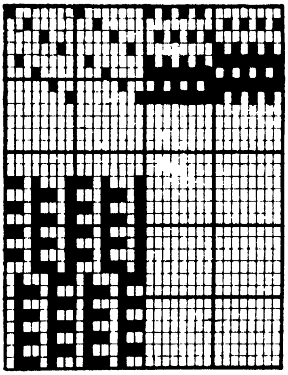

Fig. 78

FILLING EFFECTS

Serge 5-1 on 6 harness straight draw.

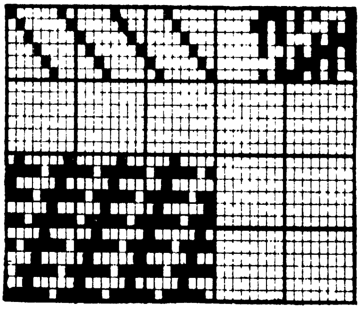

Fig. 79

10 *harness satin* on 10 shafts skip draw.

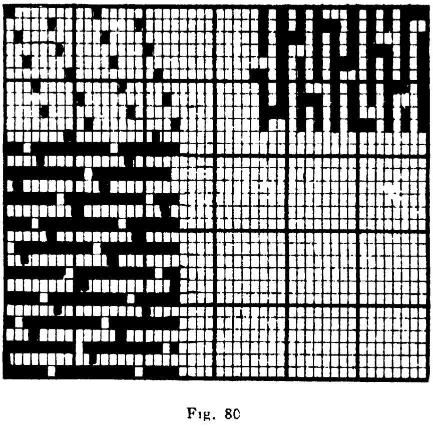

Fig. 80

Repp on 2 sections of 4 shafts each, 8 threads per section

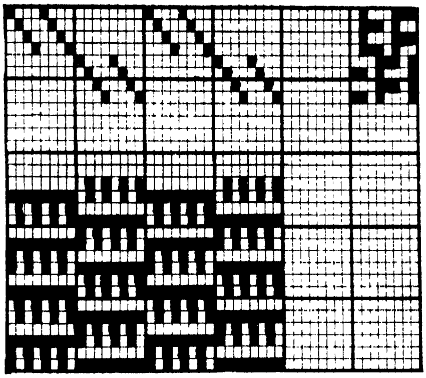

Fig. 81

PEKINS

With this name we designate fabrics in which stripes of a different interlacing run in the direction of the warp. In combining these weaves it is advantageous to have them contrast distinctly, for instance, a short weave such as taffeta or Gros de Tours, with a longer and looser one such as satin, sergé or cannele, also changes from warp to filling effects. Care must be taken to arrange the joining of the two weaves so that the last thread of one weave will cross the first thread of the other. This will prevent the threads from either stripe to slide over into the other, and so make a clean cut line.

Pekin. A stripe of

2 dents of 8 ends each, 8 shaft Satin, on 8 shafts straight draw
12 " 2 " Taffeta " 4 " " "

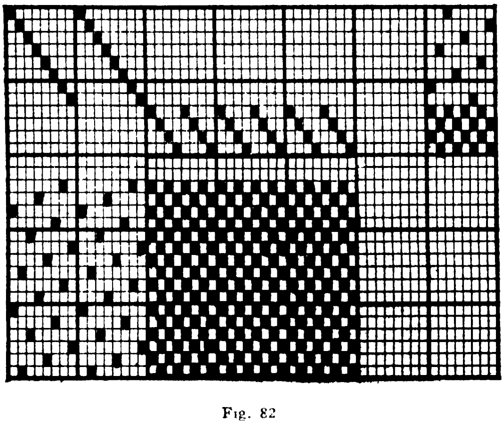

Fig. 82

Pekin. A stripe of

12 ends Cannele of 6 picks on 1st section on 4 shafts
12 " Repp " 6 threads on 2d and 3d section of 2 shafts each

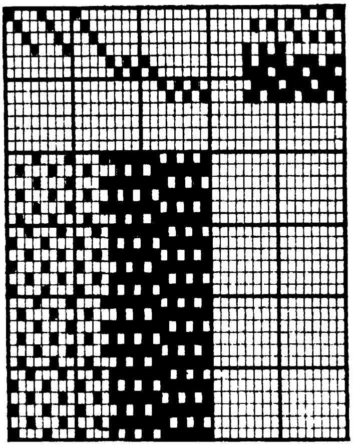

Fig. 83

Pekin. A stripe of

10	ends	5 leaf Satin	on the	1st	section of	5	shafts	straight	draw.
4	"	Taffeta	"	3d	"	2	"	"	"
18	"	Serge 3-1, 1-1	"	2d	"	6	"	"	"

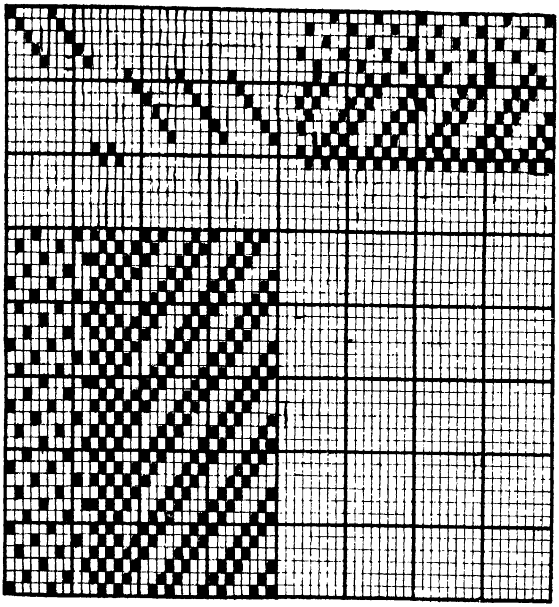

Fig. 84

BAYADÈRES

While pekins are formed by warp stripes, bayadère shows us stripes of different weaves running in the direction of the filling. The rules given in the previous chapter as to the joining of the weaves will also apply here. The warp which was raised on the last pick of the weave must stay down wherever possible on the first pick of the following weave. The number of shafts employed must go up evenly in the repeat of each one of the weaves that go into the make up of the bayadère.

Bayadère

A stripe of 24 picks Gros de Tours } on 8 shafts straight through
" 8 " 8-shaft Satin, }

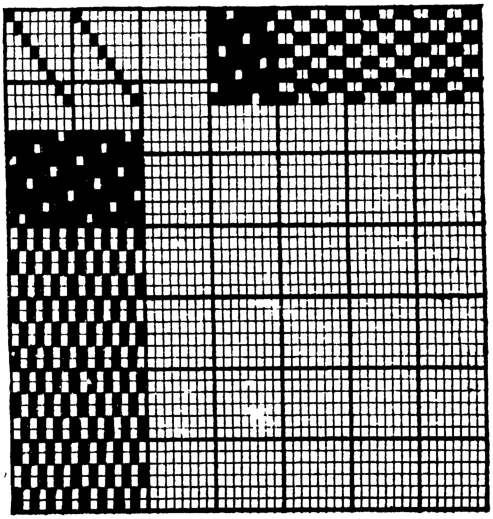

Fig. 85

Bayadère

A stripe of 18 picks 6-shaft Satin ⎫
" 6 " Serge 5-1, ⎬ on 6 shafts, straight draw.
" 4 " Taffeta, ⎭

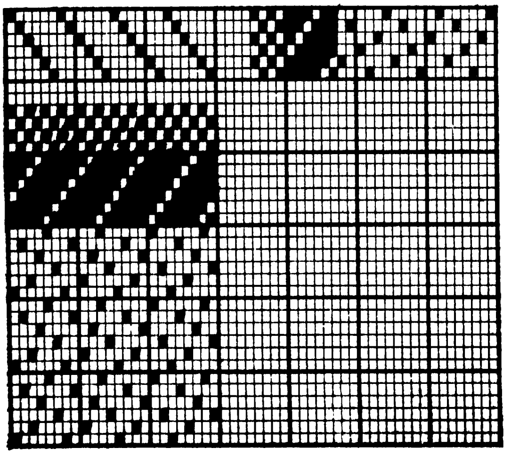

Fig. 86

CHECKS AND PLAIDS

If pekin and bayadère stripes are combined, we obtain checked fabrics, and of these an endless variety and pleasing effects can be produced with the aid of suitable color combinations.

Check

of 16 threads and 12 picks of the 4-end broken twill,
and 16 " " 12 " " Royale of 8 threads,
drawn on 4 sections of 4 shafts each

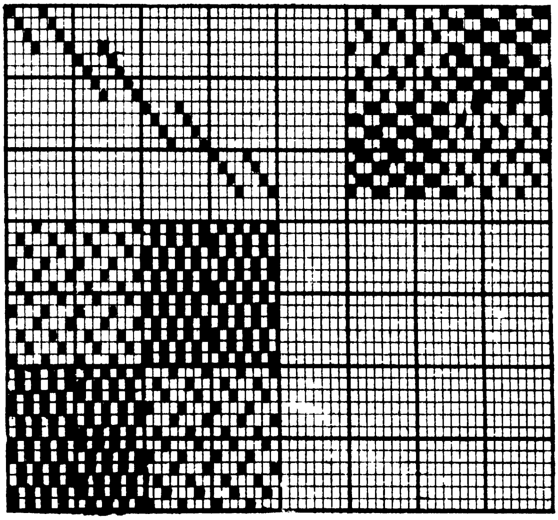

Fig. 87

Check

of 20 threads and 16 picks of 8-shaft Satin,
" 20 " " 16 " " Taffeta,
4 " " Surah 3-1,
drawn on 2 sections of 8 shafts each

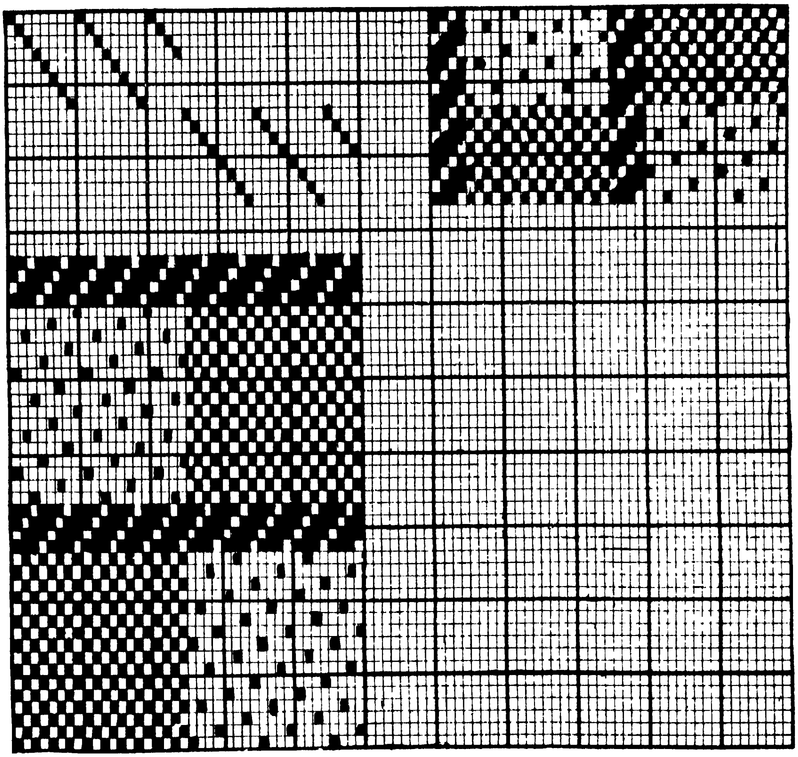

Fig 88

DECOMPOSITIO.

Under the name of *Disposition* we comprise all those points and details which we must ascertain before we can proceed with the construction of a fabric. They are:

1. **The weave.**
2. **Length and width of the cloth.**
3. **The stock and the dyeing thereof.**
4. **Reed calculation** (number of dents and ends per inch and total number of dents required).
5. **Drawing-in the warp in harness and reed.**
6. **Texture and arrangement of warp** (warping ticket)
7. **Arrangement of harness.**
8. **Reduction of filling.**
9. **Calculation of warp and filling.**
10. **Finishing.**
11. **Calculation oi cost.**

1. THE WEAVE

If a given sample is to be reproduced or imitated, it must be analyzed, and the following hints will greatly facilitate this operation to the beginner.

Cut the sample straight on two sides, and draw out a number of warp and filling threads until there is a small fringe of perhaps ¼ of an inch. This will allow a thread to be raised a little for examination, without danger of its falling out of the fabric. In most cases it is easier to dissect the filling side, that is, the interlacing of each warp-thread in the threads of the filling system. With the help of the microscope or counting glass we can easily determine over and under how many picks that thread passes and the points of interlacing are accordingly marked on designing paper. This being done for at least the length of a repeat warpways, we take it out and examine the following thread, and so on until the repeat filling ways is complete. It is advisable to ascertain how many picks ahead or back of the first examined thread the next following one binds before taking the former out.

A knowledge of the construction of weaves as explained in the foregoing chapters will enable us to determine the weave of a simple pattern by merely raising a warp thread with a needle on any point of interlacing and counting off how many picks apart from this place it makes an impression

2. LENGTH AND WIDTH OF THE FABRIC

To the length and width which the finished product is to have, we must add a certain allowance for shrinkage and *taking up* of warp during weaving. It may differ from one to ten per cent., according to the texture and weave of the fabric, and can be ascertained with sufficient accuracy by stretching out and measuring a thread of warp and filling and comparing their length with the respective measurements of the sample to be reproduced.

3. THE STOCK AND ITS DYE

Under this heading we must give the particulars as to nature, *twist, quality* and *size* of the silk, and the directions for the dyeing, whether *bright* or *souple,* and in what colors, also whether to be weighted or not.

The size is generally ascertained (in practical work) by comparing it with other silk of which the exact count is known Another method is to count the number of cocoon threads which a thread of the sample contains, adding to that 1/3 or 1/4, according to the quality of the silk; the result will be the count in deniers. To obtain it in drams divide the latter number by 17,^{3} as 1 dram is equal to 17,^{3} deniers.

Suppose we find 20 cocoon ends in a thread of silk, add 1/3, and we have 26 2/3 deniers, which, divided by 17,^{3} make 1,^{54} drams.

As silk is always more or less uneven, it is safer to count the cocoon fibers of several threads and to take the average thereof.

It requires the experience of years to judge with any degree of certainty as to the origin and quality of silk, whether it be "classical," "extra," "sublime," etc.

There are machines wherewith to ascertain exactly the twist, that is, the number of turns the silk has received in the throwing process.

In the dyeing we distinguish two great classes, of which the names themselves give a good definition. "Bright" has a brilliant luster, while "souple" has more of a dull, subdued appearance. To find out whether the silk has been weighted in the dyeing process, we may compare it with other silk of which the exact conditions are known, or we may burn a small quantity of it. Unweighted silk does not burn *readily and* leaves a residue of white ashes, *while heavy weighted silk* burns lively, leaving black charry ashes

4. REED CALCULATION

We count the number of repeats of the weave in a given space, generally ¼ or ½ inch, and multiply this with the number of threads one repeat contains, which gives us the reduction of the warp.

Suppose we had a taffeta, which, as we know, has only 2 ends to a repeat, and counted 30 interlacings per ¼ inch on one pick; we would have 60 threads per ¼ inch or 240 per one inch. In this case the reed may be 80 by 3 or 60 by 4.

Another instance: In an 8 shaft satin we count 10 warp-threads, which bind on the same pick in ¼ inch, this, multiplied by 8, equals 80 ends per ¼, or 320 per one inch; the reed will be an 80 with 4 in a dent or a 64 by 5.

In short, the number of the reed is found by dividing the number of warp-threads that are to go in one dent, in the number of ends per inch. Sometimes, the reed marks are clearly visible in a sample by holding the latter against the light Silk fabrics move with very few exceptions within the limits of 50 and 90 dents per inch.

To learn the full number of dents required for the width of the cloth, simply multiply the dents per one inch with the width, adding a certain allowance for shrinkage. The edges, of course, must also be taken in consideration, and very often the dents that are taken up by the latter are used to counter balance that shrinkage.

5. DRAWING-IN THE WARP IN HARNESS AND REED

Here we must specify the number of dents that contain the same number of ends, and whether the latter are single or double, also the number of shafts and the method of drawing-in.

6. WARPING TICKET

To make out the warping ticket, we need to ascertain the total number of ends, whether leased single or double, and the arrangement of the colors.

7. HARNESS ARRANGEMENT

This is governed by the number of ends to be drawn in and the necessary shafts. If we have, for instance, 100 threads per inch to be drawn on 4 shafts, we must give each shaft 25 heddles per inch. There are generally between 25 and 45 heddles per inch on one shaft.

8. REDUCTION OF THE FILLING

Here we state the number of picks per inch, give directions as to doubling, if such is necessary, and if more than one color or shuttle is used, the rotation thereof.

9. CALCULATION OF WARP AND FILLING

The system adopted in this country for specifying the size of silk is based on the weight in drams (avoirdupois) of a skein containing 1000 yards. A skein, thus weighing 5 drams, is technically called 5-dram silk. The number of yards of 1-dram silk to a pound must accordingly be 256000. The formulas for figuring the amount of silk required for a piece of cloth are as follows:

Warp Calculation

Multiply: Number of ends × length × count

Divide by: 1000 yards × 256 drams

$$\frac{\text{Number of ends} \times \text{length} \times \text{count}}{1000 \text{ yards} \times 256 \text{ drams}} = \text{lbs}$$

Filling Calculation

Multiply: Picks × xply × width × length of piece × count
——————————— = lbs
Divide by: 1000 yards × 256 drams

The result in both cases will be in pounds.

The system of grading the silk which is in vogue in Europe, and which is employed by a number of mills on this side, is as follows:

1 skein of 500 meters, weighing 0,05 gram = 1 denier international
or 1 " 476 " " 0,053 " = 1 " Turin system
or 1 " 476 " " 0,051 " = 1 " Milan "

The warp calculation, taking the international denier, would run:

ends in warp × length × denier × 0,05 gram
———————————
divided by: 500 meters

for the filling Picks per meter × xply × width × denier × 0,05 gram
———————————
divided by 500 meters

Result in metric weight, kilograms and grams.

10. FINISHING

Give directions as to the process of finishing to which the goods are to be subjected, whether to be pressed, calendered sized, moiréd, etc.

11. CALCULATION OF COST

If all the foregoing conditions are ascertained, and a sample or a piece of the fabric executed, it remains to the manufacturer to determine the exact figure at which he can produce the article. That this must be done with great accuracy is naturally of the utmost importance, and the calculator must know in the first place the raw stock prices, and also be acquainted with the details of the manufacturing process and the rates of wages paid therein. As a rule, the manufacturer establishes a scale of prices covering all the items of labor cost, mill expenses, etc., and uses this as a basis for his calculations.

A rule or formula for this operation cannot very well be given, as the methods vary in almost every establishment, each choosing the one best adapted to its ideas or dictates of circumstances and conditions.

DISPOSITION 1

Taffeta glacé

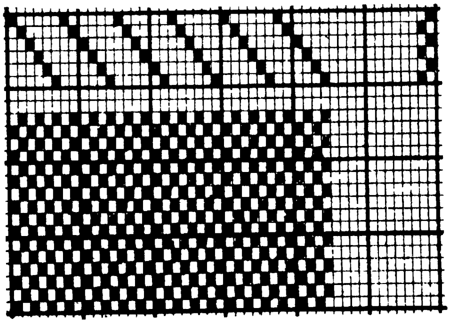

Fig. 89

Length and Width- One piece 100 yards long, 18¾ inches wide.

Stock and Dye *Warp* Ital Organ., $^{24}/_{26}$ deniers = 1,47 drams,
brown, bright, $^{11}/_{16}$ oz
Filling Japan Tram, $^{26}/_{30}$ deniers = 1,65 drams,
gold, bright $^{11}/_{16}$ oz

Reed Calculation Per 1 inch, 70 dents at 3 single ends
" 18¾ " 1313 "
add 13 " = 1% for shrinkage

Total 1326 dents

Drawing in - 1st edge, 9 dents at 3 double ends
Ground, 1308 " at 3 single "
2d edge, 9 " at 3 double "
on 6 shafts, straight through

Warping Ticket 1st edge, 27 double ends, brown
Ground, 3924 single " "
2d edge, 27 double " "

Total 4032 single ends
Length of warp 110 yards, including 10% for take up

Harness - 6 shafts, 3978 heddles per 19 inches
1 " 35 " " 1 "

Reduction of Filling Per 1 inch, [illegible] picks, 2 ends

Warp Calculation ? lbs = 4032 ends
1 end = 110 yards
1000 yards = 1,47 drams.
256 drams = 1 lb
100 = 104 (4% waste)

$$\frac{4032 \times 110 \times 1{,}47 \times 104}{1000 \times 256 \times 100} = 2{,}65 \text{ lbs, or 2 lbs. 10,4 oz.}$$

Filling Calculation — ? lbs. = 100 yards.
1 yard = 36 inches
1 inch = 102 { picks.
2 { ends.
1 pick = 19 inches.
36 inches = 1 yard
1000 yards = 1,65 drams.
256 drams = 1 lb.
100 = 108 (8% waste).

$$\frac{100\times36\times102\times2\times19\times1{,}65\times108}{36\times1000\times256\times100} = 2{,}73 \text{ lbs, or } 2 \text{ lbs. } 11{,}7 \text{ ozs.}$$

DISPOSITION 2

Surah 3 1.

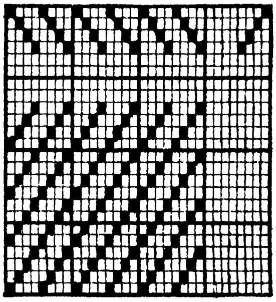

Fig. 90

Length and Width 1 piece 50 yards long, 23½ in. wide

Stock and Dyeing—*Warp*—Ital Organ., 1,30 drams = $^{20}/_{21}$ deniers,
black, bright, $^{40}/_{50}$% = $^{22}/_{24}$ ozs
Filling Cotton No 120/$_2$ black

Reed Calculation—Per 1 inch, 80 dents at 2 single ends
" 23½ " 1880 "
add 36 " - 2% for shrinkage.

Total . 1916 dents

Drawing-in 1st edge, 8 dents, 2 double ends
Ground, 1900 " 2 single "
2d edge, 8 " 2 double "
on 4 shafts, straight draw

Warping Ticket—1st edge, 16 double ends, black
Ground, 3800 single " "
2d edge, 16 double " "

Total . . 3864 single ends.
Warp 54 yards long = 8% for take up

Harness—4 shafts, 3832 heddles per 24 inches
1 " 40 " " 1 "

Reduction of Filling—Per 1 inch, 120 picks, 1 end

Warp Calculation—? lbs = 4264 ends
1 end = 54 yards
1000 yards = 1,30 drams
256 drams = 1 lb.
100 = 104 (4% waste).

$$\frac{3864 \times 54 \times 1{,}30 \times 104}{1000 \times 256 \times 100} = 1{,}10 \text{ lbs, or } 1 \text{ lb } 1{,}06 \text{ oz.}$$

Filling Calculation ? lbs = 50 yards
1 yard = 36 inches
1 inch = 120 picks
1 pick = 24 inches
36 inches = 1 yard.
840 yards = 1 skein
(No 120/2) 60 skeins = 1 lb.
100 = 110 (10% waste).

$$\frac{50 \times 36 \times 120 \times 24 \times 110}{36 \times 840 \times 60 \times 100} = 3{,}14 \text{ lbs, or } 3 \text{ lbs } 2{,}24 \text{ ozs}$$

DISPOSITION 3

Satin Duchesse

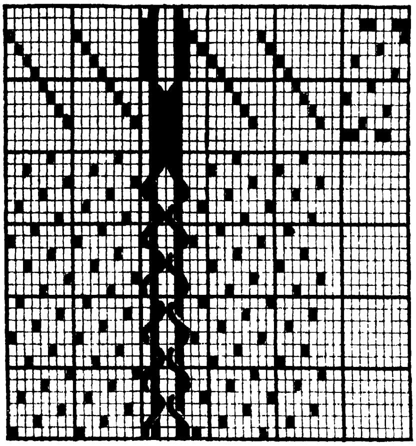

Fig. 91

Length and Width One warp 300 yards long, 10 pieces of 60 yards 23 inches wide, 2 pieces in width, with one cut edge.

Stock and Dyeing *Warp*—Ital Organ, 1$^5/_{100}$ drams, black, bright, 20/22 oz

Filling—Jap Tram, 1$^5/_{10}$ and 2$^5/_{10}$ drams, black, souple, 40/44 oz

We should use for this fabric 1 end filling, 5-thread, 4$^5/_1$ drams, but as we have none of this size on hand, we take 1 end, 2 thread, 1$^5/_{10}$ drams, and 1 end, 3 thread, 2 $^5/_{10}$ drams

Reed Calculation 1 inch, 66 dents, 4 single ends
46 " 3036 "
54 " (1$^3/_4$% shrinkage)

Total 3090 dents

Drawing-in

1st edge, { 2 dents, 6 × 2, black
{ 13 " 1 × 2, white
Ground, 1514 " 4 × 1, black

Cut edge, { 2 " 6 × 2, "
{ 1 " 2 × 4, "
{ 3 " empty
{ 1 " 2 × 4, "

Ground, 1514 " 4 1, black

2d edge, { 2 " 6 × 2, black
{ 13 " 1 × 2, white

Satin on 8 shafts, straight draw
Cross-thread for split edge on 3 shafts, see design

Warping Ticket—

Edge, { [illegible]/2 black,
{ [illegible]/2 white,
Ground, [illegible] black, } twice over
Edge, { [illegible]/2 white,
{ [illegible]/2 black }

12208 end black, { 318 yards long
416 " white, { 6% shrinkage

[illegible] black for ground thread, 300 yards long.
[illegible] " " whip " 360 " "
each one on a separate little roll

Harness 8 shafts, 12368 heddles, 47 in
1 " 33 " 1 "
for the split edge 3 shafts, of which one has only half a heddle.

Filling Per 1 in., 80 picks, 2 ends (as described before)

Warp Calculation— ? lbs. = 12224 ends, black (416 white)
1 end = 318 yards
1,000 yards = 1,55 drams
256 drams = 1 lb
100 = 104 (4% waste)

(416)
$$\frac{12224 \times 318 \times 1{,}55 \times 104}{1000 \times 256 \times 100} = 24{,}477 \text{ lbs org black}$$
= 0,833 " " white.

Filling Calculation— ? lbs = 300 yards
1 yard = 36 inches
1 inch = 80 picks
1 pick = 47 inches
36 inches = 1 yard
1000 yards = 4,5 drams.
256 drams = 1 lb
100 = 108 (8% waste)

$$\frac{300 \times 36 \times 80 \times 47 \times 4{,}5 \times 108}{36 \times 1000 \times 256 \times 100} = 21{,}414 \text{ lbs}$$

DISPOSITION 4

Armure Satinée

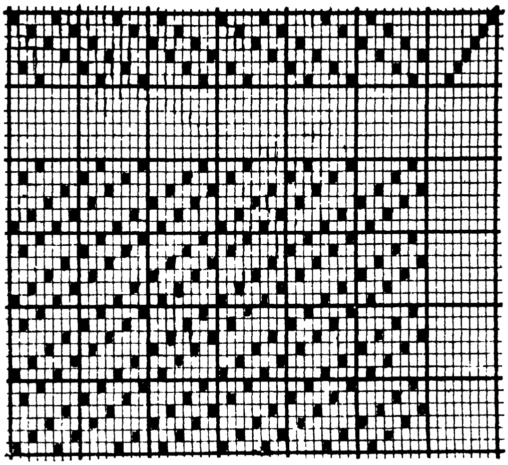

Fig 92

Length and Width One piece 60 yards long, 19 in. wide

Stock and Dyeing *Warp* – Jap Organ, 1,48 drams, black, bright, $^{5}/_{20}$ oz
Filling 3 threads Jap Tram, 2,95 drams, black, bright, $^{1}/_{26}$ oz

Reed Calculation Per 1 inch, 60 dents × 4 single ends.
" 19 " 1140 "
32 " (3% for shrinkage).

Total . . 1172 dents

Drawing-in 1st edge, 12 dents × 4 double
Ground, 1148 " × 4 single
2d edge, 12 " × 4 double
on 12 shaft, straight through,
or on 6 shafts, as design indicates

Warping Ticket 1st edge, 48/2 black
Ground, 4592/1 "
2d edge, 48/2 "

Total 4784 single ends 64 yards long
– 6$^{1}/_{3}$% for take up.

Harness 6 shafts, 4088 heddles per 19½ inches
1 " 40 " " 1 "

Reduction of Filling Per 1 inch, 104 picks, 2 ends

Warp Calculation—? lbs = 4784 ends.
1 end = 64 yards
1000 yards = 1,48 drams.
256 drams = 1 lb
100 = 104 (4% waste)

$$\frac{4784 \times 64 \times 1{,}48 \times 104}{1000 \times 256 \times 100} = 1{,}81 \text{ lbs, or } 1 \text{ lb } 13{,}44 \text{ ozs.}$$

Filling Calculation – ? lbs. = 60 yards
1 yard = 36 inches
1 inch = 104 { picks
2 } ends
1 pick = 19½ inches
36 inches = 1 yard
1000 yards = 2,95 drams
256 drams = 1 lb
100 = 108 (8% waste).

$$\frac{60\times36\times104\times2\times19{,}5\times2{,}95\times108}{36\times1000\times256\times100} = 3{,}03 \text{ lbs., or } 3 \text{ lbs } 0{,}48 \text{ ozs.}$$

DISPOSITION 5

Surface Printed Armure

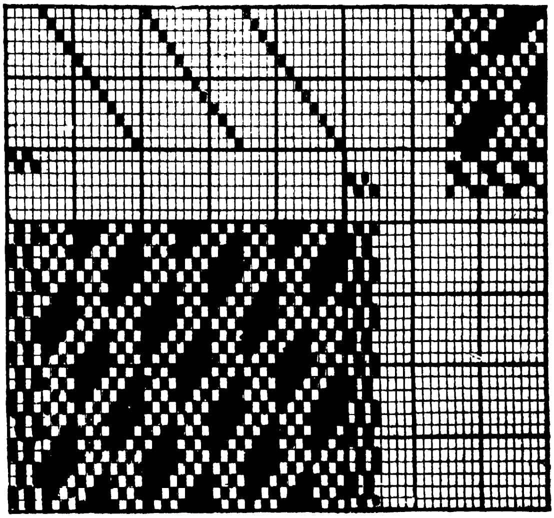

Fig. 93

Length and Width One piece 50 yards long, 18½ in. wide.

Stock and Dyeing— *Warp* - Ital Organ, 1,50 drams, $^{24}/_{26}$ deniers, white bright, pure dye

Filling -5 thread Ital Tram, 4 drams, deniers, white, bright, pure dye

Reed Calculation Per 1 inch, 52 dents, 2×2
" 18½ " 962 "
20 " (2% for shrinkage)

Total . 982 dents

Drawing-in 1st edge, 7 dents, 4×2 gros de Tours
Ground, 968 " 2×2 armure
2d edge, 7 " 4×2 gros de Tours.
Armure ground on 12 shafts, straight draw
Gros de Tours, edges on 4 shafts

Warping Ticket— Ground warp, 54 yards
1936/2 white
Gros de Tours edges, 55 yards
2×28/2 white, on separate rolls
Total . 3984 single ends

Harness —12 shafts, 1936 heddles, per 18½ inches
1 " $8^{4}/_{5}$ " " 1 "
4 Shafts gros de Tours edges, with 28 heddles on each side

Reduction of Filling Per 1 inch, 96 picks, 1 end

Warp Calculation- ? lbs. - 3984 ends
1 end = 54 yards
1000 yards = 1,50 drams
256 drams = 1 lb
100 = 104 (4% waste)

$$\frac{3984 \times 54 \times 1{,}50 \times 104}{1000 \times 256 \times 100} = 1{,}31 \text{ lbs, or } 1 \text{ lb. } 4{,}96 \text{ ozs.}$$

•**Filling Calculation** — ? lbs. = 50 yards
1 yard = 36 inches
1 inch = 96 picks
1 pick = 19 inches
36 inches = 1 yard
1000 yards = 4 drams
256 drams = 1 lb.
100 = 108 (8% waste).

$$\frac{50\times36\times96\times19\times4\times108}{36\times1000\times256\times100} = 1{,}54 \text{ lbs., or } 1 \text{ lb. } 8{,}64 \text{ ozs.}$$

After weaving, the small flower effects have to be printed on the cloth

DISPOSITION 6

Pekin: 8 shaft satin and repp.

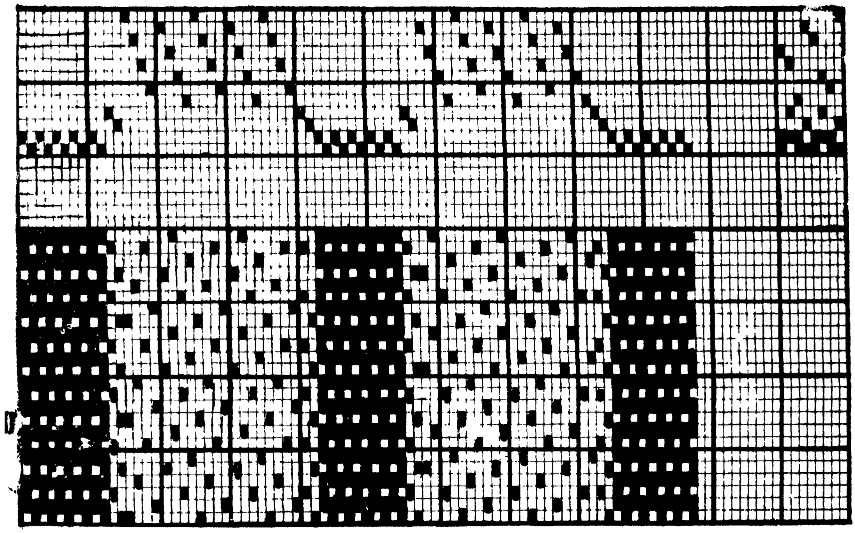

Fig 94

Length and Width -1 piece 100 yards long, 20¼ in. wide.

Stock and Dyeing —*Warp* -
- Ital. Organ., 1$^{35}/_{100}$ drams, black, bright $^{20}/_{22}$ oz.
- Ital. Organ, 1$^{15}/_{100}$ drams, sky, bright pure dye
- Cotton No. $^{100}/_{2}$, scarlet.

Filling —3 threads Jap. Tram, 2$^{8}/_{10}$ drams, scarlet bright, $^{14}/_{16}$ oz.

Reed Calculation -Per 1 inch, 68 dents,
- 6×1, black satin.
- 6×2, colored "
- 2×1, " repp.

" 20¼ " 1377 "
23 " (1½% for shrinkage).

Total . . . 1400 dents.

Drawing-in —1st edge,	7	dents,	6×2	satin		
Ground,	34	"	6×1	"		
	2	"	6×2	"		
	10	"	6×1	"	twice	
	2	"	2×1	repp	over.	
	10	"	6×1	satin		
	2	"	6×2	"		
	39	"	6×1	"		
	5	"	2×1	repp	twice	
	4	"	6×1	satin	over.	7 times
	5	"	2×1	repp		over
	15	"	6×1	satin		
	2	"	2×1	repp		
	15	"	6×1	satin		
	5	"	2×1	repp	twice	
	4	"	6×1	satin	over.	
	5	"	2×1	repp.		
	5	"	6×1	satin		
	28	"	6×1	"		
2d edge,	7	"	6×2	"		

Satin on 1st section of 8 shaft skip draw.
Binder " 2d " " 2 "
Repp " 3d " " 2 "

On each side of every repp stripe two ends of the satin warp must be entered on the 2 binder shafts (2d section), to prevent the ends of the satin to slide over into the repp stripes.

Warping Ticket– I *Beam satin*, 106 yards

1st edge, $42/_2$ black
Ground, $204/_1$ "
$12/_2$ sky.
$180/_1$ black.
$12/_2$ sky
$234/_1$ black
$48/_2$ sky 7 times over
$180/_1$ black.
$48/_2$ sky
$30/_1$ black
$168/_1$ "
2d edge, $42/_2$ "

6132 single ends black
1680 " " sky.

II *Beam repp*, 110 yards

$4/_1$ scarlet.
$4/_1$ "
$10/_1$ "
$10/_1$ "
$10/_1$ " 7 times over
$4/_1$ "
$10/_1$ "
$10/_1$ "
$10/_1$ "

504 single ends scarlet cotton

This warp has to be beamed in stripes. Make out a diagram for the warper the same as shown in Fig. 95

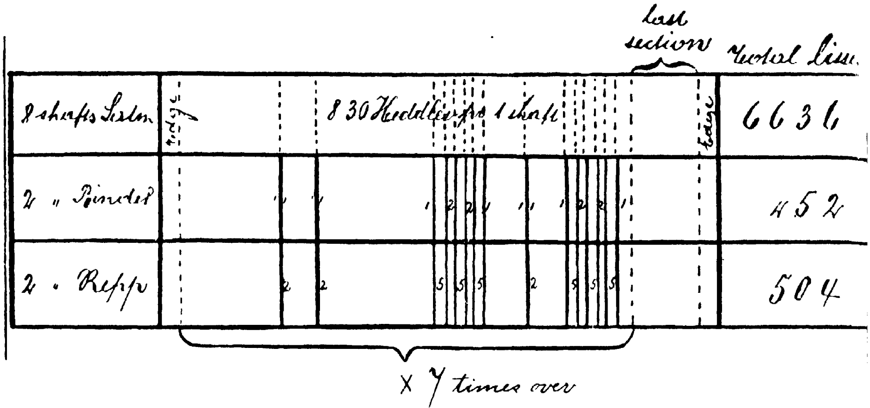

Fig. 95

Harness Fig 95 shows how to make a diagram of a harness for a Pekin The heddles are marked per one shaft As the repp stripes are only small ones, we use for the satin a full harness, that is, one without open spaces for the repp stripe All together we have in the satin warp 6888 single and double ends to draw in, of these 252 ends are used for binders, on both sides of the repp stripes. Thus remain for

8 shafts, 6636 heddles per 20½ inches
1 " 40 " " 1 "

Reduction of Filling Per 1 inch, 144 picks, 1 end

Warp Calculation – [illegible] lbs = 6132 ends (1080 ends sky)
1 end = 106 yards
1000 yards = 1,35 drams (sky 1,15 drams)
256 drams = 1 lb.
100 = 104 (4% waste)

$$\frac{6132 \times 106 \times 1{,}35 \times 104}{1000 \times 256 \times 100} = 3{,}56 \text{ lbs for black, or 3 lbs 8,96 ozs}$$

$$\frac{1080 \times 106 \times 1{,}15 \times 104}{1000 \times 256 \times 100} = 0{,}83 \text{ lbs for sky, or 0 lbs 13.28 ozs.}$$

? lbs. = 504 ends
1 end = 110 yards.
840 yards = 1 skein
(No 100/2) 50 skeins = 1 lb
100 = 104 (4% waste)

$$\frac{504\times 110\times 104}{840\times 50\times 100} = 1{,}37 \text{ lbs scarlet cotton, or 1 lb 5,92 ozs}$$

Filling Calculation — ? lbs = 100 yards
1 yard = 36 inches
1 inch = 144 picks
1 pick = 21 inches
36 inches = 1 yard
1000 yards = 2,8 drams
256 drams = 1 lb
100 = 108 (8% waste).

$$\frac{100\times 36\times 144\times 21\times 2{,}8\times 108}{36\times 1000\times 256\times 100} = 3{,}57 \text{ lbs., or 3 lbs 9,12 ozs}$$

JACQUARD WEAVES

Jacquard weaves usually show on a plain ground figure or flower effects. To obtain these effects the ground is made of one weave, say taffeta, while the figures or flowers are produced in another weave, say satin.

We enter the warp through a jacquard harness, and according to the repeat use a 200, 400, 600, 900, 1200, etc., hook jacquard machine, which means 200, 400, 600, 900 and 1200 ends per repeat.

With a 600-hook machine a larger repeat can be produced than with a 499-hook machine. For instance, if we want to make a cloth the figures of which are to be two inches apart, it is a two-inch repeat, and use the count of 50/4 or 200 ends per inch, we can use a 400-hook machine, 2 in. x 200 ends. But we can make this cloth also on a 1200-hook machine, only the repeat must be designed three times. The advantage of using a 1200-hook machine with the count 50/4 is that 2, 3, 4, 6-inch repeats can be produced, while with a 400-hook machine, only a 2 inch repeat can be made.

There is no end to all the different weaves and the possible flower and other pattern effects that can be made with the jacquard machine. For a jacquard weaving plant the designing is the most important factor.

BOX LOOM WEAVES INCLUDING CREPES

Box looms are required for weaves such as bayadères, checks, plaids (see pages 63-65), bengalines, crêpes, etc., where two or more shuttles are needed to bring out the effect.

For the crêpes (crêpe de chine, crêpe georgette) only two shuttles are needed, while plaids and other articles are made with more shuttles.

To weave such articles the loom or the lay must be fitted with two or more shuttle boxes on one or both sides of the loom.

If a manufacturer decides to change plain looms to box looms or buy new box looms, it is wise to get 4 x 4 boxes, or four shuttle boxes on each side.

With these looms about everything can be made that is called for in box-loom effects, and as styles change, it is wise to be prepared.

MANUFACTURING COSTS

The calculator first ascertains for the warp: What silk will be used, the cost of the same, total number of ends in the warps for the amount of silk, cost of throwing, dyeing, winding, warping, twisting, entering, and weaving

Then the filling: Silk to be used, how much, cost of silk, cost of throwing, dyeing, winding, doubling, quilling.

After this determine the cost of weaving, cloth picking, finishing, factory costs, and selling expenses.

To-day most of the operations are paid by "piece work."

The calculator must always take into consideration that poor raw silk or poor dyeing make production slow increase the cost of labor, and also that more waste will be made.

THROWING: Regular organ usually has 16 turns per inch in the first twist and 14 turns to the inch in the second or reverse twist. Tram receives only one twisting, about three turns to the inch.

As the warp twisting-in is paid for at so much per hundred or thousand ends, no matter how short or long the warp is, it is a saving to make the warps as long as possible, especially in raw, black and staple colors.

The calculator must not forget the cost of entering the first warp in a harness, also the reeding.

Most mills figure the cost of harness and reed in the expense accounts. If plain and fancy goods are made an extra percentage should be figured for the latter.

EXPENSES are figured differently, as almost every manufacturer has his own system. If a mill makes only a few staple articles it is easy to put down the cost of expenses. Say the mill has a production of 500,000 yards per year, that the expense amounts to $35,000, the cost then is 7 cents per yard.

Manufacturers making all kinds of goods sometimes figure the expenses in percentage, say, for plain goods, with a few picks, like gros-grain, peau de soie, etc., 10 per cent. per yard. Taffeta, satin, etc., having more picks, 12½ per cent. per yard, and fancy and jacquard goods, 15 per cent. per yard. In the expense account we include all charges except raw silk, throwing, dyeing and piece work.

SELLING EXPENSES Before a calculation is finished we must add the selling expenses to the cost, also take account of the trade discount. Small mills usually sell through a commission house, which pays all expenses and charges a certain commission. Many large firms have their own selling end, and some have their sales guaranteed by a commission house or a bank.

CALCULATIONS

The prices marked in the following calculations are about as in "normal times." Absolutely correct piece work prices cannot be given as different localities have different prices.

Calculations are usually made per 100 yards, 100-meter warps.

Most goods gain from 3 to 7 per cent in weaving. That is, if we make a warp of 300 meters for a satin and we obtain 315 yards of cloth, this gain should not be calculated, as usually there is no account taken of samples used in the selling department. But the loss in length should be figured and taken account of on goods with a heavy rib, such as moré, faille etc.

Disp 7—A 3 1/3-inch repeat can be obtained with a 400 hook jacquard machine, seven repeats in a width of 23 inches.

Disp 8—Taffeta weave, but the two cotton picks must go in one hole. This article can only be made with at least two shuttle boxes on each side. For warping use a single and double cross reed, heavy cotton, no knots must be tied.

Disp 10—This article must be warped with as much tension as possible and no knots should be tied in. Silk is to be delivered on bobbins from throwster.

CANTON CREPE

Disp 9—Can also be made with Canton silk for filling and may be called Canton crêpe. As Canton silk is much cheaper than Japan, the manufacturer can use 4-thread Canton instead of 3 thread Japan for filling at a little difference in cost, thus the cloth will be heavier, but Canton silk is not as even and clean as Japan.

Article—Taffeta Glace Reed 70/3
Disp 1 Width 18¾ in

Warp—Ital. Ex Class 12/14	$5.00 raw silk	
	.60 throwing	
2 Thread Organ brown bright	.45 dyeing	
16-oz	.15 winding	
raw lbs 2.60	$6.20	$16.23
Warping 4032 at 3c		1.21
Twisting 3978 at 25c per 300 meters		.33
Filling—Jap Tram Best No 1 13/15	$4.25 raw silk	
	.45 throwing	
2/2 ends 104 picks	.45 dyeing	
	.15 winding	
gold bright 16 oz	.15 doubling	
	.10 quilling	
raw lbs 2.73	$5.55	15.02
Weaving		7.00
Picking		1.00
Finishing		1.00
Expenses		7.00
		$48.79

5% trade discount
7½% selling commission
Divide by 87½
Cost per yard = $0.5576

Article—Surah 3-1 Reed 80/2
Disp 2 Width 36 in

Warp—Ital Ex Class 10/12	$5.20	
	.65	
2-Thread Organ. bright black	.81 discount 15%	
24 oz.	.30 dyed 20%	
lbs 3.36	$6.96	$23.39
Warping 5904 at 2¾c		1.62
Twisting 5872 at 25c 600 lb warp		.25
Filling—Cotton 120/1	$1.25	
	.10 dye	
black 1 end 120 picks	.08 winding	
	.07 quilling	
lbs 9.50	$1.50	14.25
Weaving		12.00
Picking		1.50
Finishing		2.00
Expenses		7.00
		$62.01

5% discount
6% commission
Divide by 89
Cost per yard = $0.6967

Article—SATIN DUCHESSE Reed 66/4
Disp. 3 Width 2 x 23 in

Warp—Ital. Ex. Class 12/14	$5.00	
	.60	
2-Thread Organ black bright	.73	
22 oz.	.21	
lbs. 8.50	$6.54	$55.59
Warping 12624 at 2¾c		3.47
Twisting—12256 at 25c 600 meters		.51
Filling—Jap Tram No 1—14/16	$4.00	
	.40	
black souple 44 oz	1.60 net	
	.40	
½ and 1/3 1/5 80 picks	.40 doubling	
	.30	
lbs 7.14	$7.10	50.69
Weaving		13.00
Picking		2.00
Finishing		2.50
Expenses		8.00
		$135.76
	Divide by 89	
	Cost per yard	$0.7627

Article ARMURE SATIN Reed 60/4
Disp 4 Width 26 in.

STOCK AND DYE

Warp Jap Ex 12/14	$4.75	
	.60	
2-Thread Organ black bright	.64	
20 oz	.19	
lbs 4.30	$6.18	$26.57
Warping 6520 at 2¾c		1.79
Twisting—6421 at 25c 600 meters		.27
Filling—Jap Tram No 1 16/18	$4.00	
	.30	
black bright 26 oz	.94	
	.25	
2/3 ends 104 picks	.25	
	.17	
lbs 6.80	$5.91	40.19
Weaving		10.00
Picking		1.00
Finishing		1.00
Expenses		7.00
		$87.82

Divide by 89
Cost per yard = $0.9867

Article PRINTED ARMURE Reed 52/2/2
Disp 5 Width 18½ in

STOCK AND DYE

Warp—Ital Ex. Class 12/14	$5.00	
2 Thread Organ. white bright	60	
P D.	23	
	.12	
lbs 2.62	$5.95	$15.59
Warping 3984/1 at 3c.		1.20
Twisting 1992/2 at 30c 300 meters		20
Filling—Ital Tram souple 13/14	$4.50	
	30	
white bright P D	23	
	10	
1/5 end 96 picks	.07	
lbs 3.08	$5.20	16.02
Weaving		8.00
Picking		1.00
Finishing and Printing		5.00
Expenses		8.00
		$55.01

Divide by 87½
Cost per yard = $0.6287

Article—SATIN STRIPED REPS Reed 60/62
Disp 6 Width 20¼ in.

STOCK AND DYE

Warp—Ital Ex Organ 24/26	$5.00	
black bright *22* oz	.60	
	.73	
	.21	
lbs 3.56	$6.54	$23.28
Ital Ex. Organ 18/20	$5.20	
	.65	
sky bright P.D.	.23	
	.12	
lbs .83	$6.20	5.15
Cotton 100/2	$1.00	
	.12	
	.08	
scarlet lbs 1.37	$1.20	1.64
Warping—8316 at 4c		3.32
Twisting—7434 at 50c 300 meters		1.24
Filling—Jap tram No 1 14/16	$4.00	
	.35	
scarlet bright 16 oz 1/3 ends	.45	
	.15	
144 picks lbs 3.57	.10	
	$5.05	18.04
Weaving		12.00
Picking		1.00
Finishing		1.00
		$66.67
Expenses 15%		10.00
		$76.67

Divide by 87½
Cost per yard = $0.8763

Article—MESSALINE BROCADE Reed 60/3
Disp. 7 Width 23 in.

Warp Jap. Ex. 13/15	$4.50	
	.60	
2-Thread navy bright 16 oz	.45	
	.15	
lbs. 3.20	$5.70	$18.24
Warping—4320 at 3c.		1.30
Twisting—4260 at 30c 300 meters		41
Filling—Jap Tram No 1 13/15	$4.00	
	35	
emerald ex. bright dye 24 oz	95	
	.25	
1/3 ends 100 picks	15	
lbs 2.50	$5.70	14.25
Weaving		9.00
Picking		1.00
Finishing		1.00
		$45.20
Expenses 15%		6.78
		$51.98

Divide by 87½
Cost per yard = $0.5941

Article—BENGALINE Reed 72/2 by 1 single; 1 double
Disp 8 Width 36 in.

Warp Jap ex 13/15	$4.50		
	.60		
2-Thread Organ black bright	64		
20 oz	19		
lbs 5.77	$5.93		$34.22
Warping—7964 at 2¾c			2.19
Twisting 5296 at 30c 600 meters			27
Filling—56 picks by	$4.50		
5 organ 2 Cotton	60		
	64		
	19	45	
	12	.10	
40 picks Organ as warp	$6.05	08	6.05
lbs. 1		07	
16 picks black cotton 15/4			
lbs. 22.50		$ 70	15.75
Weaving			12.00
Picking			1.50
Finishing			3.00
Expenses			8.00
			$82.98

Divide by 91
Cost per yard = $0.9119

Article—Crepe de Chine (Taffeta weave) Reed 60/2/2

Disp 9 Width 40 in.

44½ in. in reed

Warp—Jap. Ex. Grege 20/22	$4.50	
	.05 winding	
2% waste lbs 5.60	$4.55	$25.48
Warping—5340/2 at 2½c		2.67
Twisting—5340/2 at 25c 600 meters		.23
Filling—Jap No 1 13/15		
4 ends hard twist 60 turns	$4.00	
	1.25 throwing	
84 picks by 2 right, 2 left twist	.05 quilling	
25% waste and shrinkage	$5.30	
lbs. 6.00		31.80
Weaving		9.00
Finishing and dyeing		5.00
Picking		1.00
Expenses		7.00
		$82.18
	5% discount	
	5% selling expense	
	Divide by 90	
	Cost per yard	$0.9131

Article—Crepe Georgette Reed 50/2

(Taffeta weave) by 1 right, 1 left twist

Disp 10 Width 40 in 47 in in reed

Warp—Ital Ex Class 16/18 Raw	$5.20	
	1.60	
2-Thread hardtwist 75 turns	$6.80	$36.72
30% shrinkage and waste lbs 5.40		
Warping—4640/1 30/2 4700 at 4c		1.90
Twisting 4700 at 50c 600 meters		.40
Filling—Same silk as warp		
100 picks by 2 right, 2 left twist	$5.20	
	1.60	
	.10	
lbs. 5.00	$6.90	34.50
Weaving		15.00
Picking		1.00
Finishing and dyeing		6.00
		$95.52
Expenses 12½%		11.94
		$107.46
	Divide by 87½	
	Cost per yard = $1.2281	

CALCULATION BLANK

ARTICLE ____________________ REED ____________

DISP ____________________ WIDTH ____________

WARP						
WARPING						
TWISTING						
FILLING						
WEAVING						
PICKING						
FINISHING						
EXPENSES						

PRICE PER YARD